Building an Information Society: a Latin American and Caribbean Perspective

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Contents

Abstract

New technological options that permit the use of digital systems to create and disseminate information around the world are paving the way for new means of organizing society and economic production and are gradually giving rise to a meta-paradigm that has come to be referred to as the "Information Society". Viewed from the perspective of developing countries, the question of how to employ this emerging paradigm to achieve broader development goals and to integrate them more fully into the global Information Society is an issue of the utmost importance on the development agenda. In seeking to address this challenging issue, the present document asks three key questions:

1. What does the "Information Society" consist of?

The first chapter of this study develops an analytical framework to consider the many complex issues involved in the construction and operation of an Information Society.

2. What are the basic characteristics and distinctive regional aspects of the transition to an Information Society?

In order to understand what current and future paths Latin America and the Caribbean can choose to follow in making the transition to an Information Society, chapters two, three and four review some of the specifically regional features of the current process.

3. What policies can help to facilitate the transition towards an Information Society?

The fifth and final chapter proposes a positive agenda for the Latin American and Caribbean region's transition to an Information Society.

Resumen

Las nuevas tecnologías que permiten crear y difundir información en todo el mundo mediante sistemas digitales están conduciendo a nuevas formas de organización social y producción, y dando origen gradualmente a un metaparadigma conocido como "sociedad de la información". Ante esta situación, la búsqueda de formas de aprovechar este paradigma emergente para lograr metas cada vez más amplias e integrarse más plenamente en la sociedad mundial de la información adquiere una importancia fundamental para los países en desarrollo. En vista de este desafío, en el presente documento se plantean tres preguntas de primordial importancia:

1. ¿En qué consiste la sociedad de la información?

En el capítulo I del estudio se ofrece un marco analítico para la consideración de los numerosos y complejos problemas que suponen la construcción y el funcionamiento de la sociedad de la información.

2. ¿Cuáles son las características básicas y las peculiaridades regionales del proceso de transición a la sociedad de la información?

Para facilitar la comprensión de las diversas vías que pueden tomar América Latina y el Caribe en el proceso de transición a la sociedad de la información, ahora y en el futuro, en los capítulos II, III y IV se examinan algunas de las características de este proceso en la región.

3. ¿Qué políticas podrían facilitar la transición a la sociedad de la información?

En el capítulo V se presenta una agenda positiva para la transición de América Latina y el Caribe a la sociedad de la información.

Preface

The concept of an "information society" refers to the paradigm shift now taking place in social and productive organization as the world moves into the twenty-first century. In view of the sweeping nature of these changes, representatives of the countries of Latin America and the Caribbean gathered at the Regional Meeting on Information Technology for Development (Florianopolis, 20-21 June 2000), convened by the Government of the Federative Republic of Brazil in collaboration with ECLAC, which served as its secretariat. In the Declaration of Florianopolis, the Latin American and Caribbean countries expressed their "shared aspirations … to become full-fledged members of the information society". This declaration was the starting point for the research project on information and communication technologies (ICTs), the digital economy and the information society which was subsequently carried out by ECLAC.

In a field where the current state of knowledge can be characterized as even yet being at a pre-theoretical stage of development, this project was aimed at creating a theoretical framework for the complex issues raised by the information society paradigm and, in a parallel effort, to monitor and support current developments in Latin America and the Caribbean. Following the completion of two preparatory studies, in November 2001 ECLAC invited a group of experts from the public and private sectors and from civil society to deliberate upon existing visions of the process involved in building an information society in Latin America and the Caribbean. As a result of this meeting, 24 different studies have been carried out by 19 authors from Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Europe and the United States in order to provide a clearer and more complete picture of ongoing developments in this connection.

Martin Hilbert, a Researcher with the Division of Production, Productivity and Management of ECLAC, coordinated this effort. Jorge Katz, Director of the Division, provided research guidance and comments on several versions of the monograph. During this process a theoretical model was devised which permits the issues relating to the construction and functioning of an information society to be embedded into a coherent conceptual framework. The findings of this project are being presented here in an effort to contribute to current global initiatives regarding ICTs and the information society (such as the United Nations Information and Communication Technologies Task Force and the World Summit on the Information Society, 2003-2005) and to support similar endeavours at the national and local levels.

José Antonio Ocampo

Executive Secretary

Economic Commission for Latin America and the Caribbean

Overview

The concepts of the "Information Society" and a "knowledge-based Digital Economy" are paradigms, which are profoundly transforming the world at the beginning of this new millenium. This transformation is mainly driven by new ways of creating and spreading information through digital technologies. The digitization of flows of information, communication, and coordination mechanisms is seeping into in many different sectors of society and pushing toward a new social and productive order. This form of "digital activity" is an increasingly global phenomenon, emerging —mainly— from mature industrial societies. The rate at which a society adopts this technology-based model depends very much on the degree of development of that society. However, technology is not only the child of development (as it derives from the development process), but is also, to a large extent, its parent (since it is also a tool for development).

For developing countries, the question of how to implement this emerging technology paradigm in order to achieve greater development goals and to better integrate themselves into the global Information Society, is becoming more pressing on the development agenda. Though Latin America and the Caribbean were already late in coming into the "industrial age" paradigm, the role the region will play in the global Information Society and the "digital age" is still yet to be seen.

In order to tackle the challenging task of incorporating the Information Society paradigm into the development agenda, this book proposes to address three essential questions:

(1) What does an "Information Society" consist of?

To identify the "building blocks of an Information Society", the model which is presented in this book proposes a three-dimensional conceptual framework, structured along horizontal, vertical and diagonal fields of interest.

(2) What are the basic characteristics and regional particularities of the transition towards an Information Society?

An Information Society is not built on a vacuum. The path towards the "digital age" is greatly determined by the degree of industrialization in any given country. In order to understand the current path and identify the potential future direction a country can take in its transition toward becoming an Information Society, regional characteristics must be considered (such as the general degree of development in all its forms, markets, institutions, educational standards, public policies, culture, etc.).

(3) What policies can help the transition towards an Information Society?

Based on the findings of questions (1) and (2), policies must be found that support and guide a specific region or country through its "optimum transition path" toward an "Information Society".

This book is divided into three parts, which are designed to address these questions. The first part of the book (Chapter I) discusses themes and issues related to the Information Society paradigm. The conceptual framework elaborated in the first part of the book, is based on general characteristics of Information and Communication Technologies (ICT) and the resulting "process of digitization", which are at the core of the new paradigm. ICT are defined as technical systems that accept, manipulate and process information and facilitate communication between at least two parties. ICT are therefore more than informatics and computers, since they do not operate as isolated systems, but are an integral part of a network. They are also more than broadcasting technologies, since ICT systems not only disseminate information, but also facilitate interactive communication. The current process of "ICT-convergence" (namely the merger of Information Technologies, Communication Technologies and informatics solutions) introduces more dynamism into the technological system, which is often simplistically referred to as "ICT". The deployment of ICT results in a what is called a "process of digitization". In this process information flows, communication processes and coordination mechanisms —whether they be relayed through text, sound, voice, image, etc are codified into binary digits.[1] Digital ICT use a language of binary digits to recognize and manipulate information and to communicate between each other.

1 Binary digits are the smallest indivisible unit of digital information- either a one or a zero. Although computers usually provide instructions that can test and manipulate bits, they generally are designed to store data and execute instructions in bit multiples called bytes. In most computer systems, there are eight bits in a byte.

The second part of the book (Chapters II, III and IV) focuses on the situation in and perspective of Latin America and the Caribbean. This is the most extensive part of the book and is structured along several "horizontal", "diagonal" and "vertical" fields of interest.

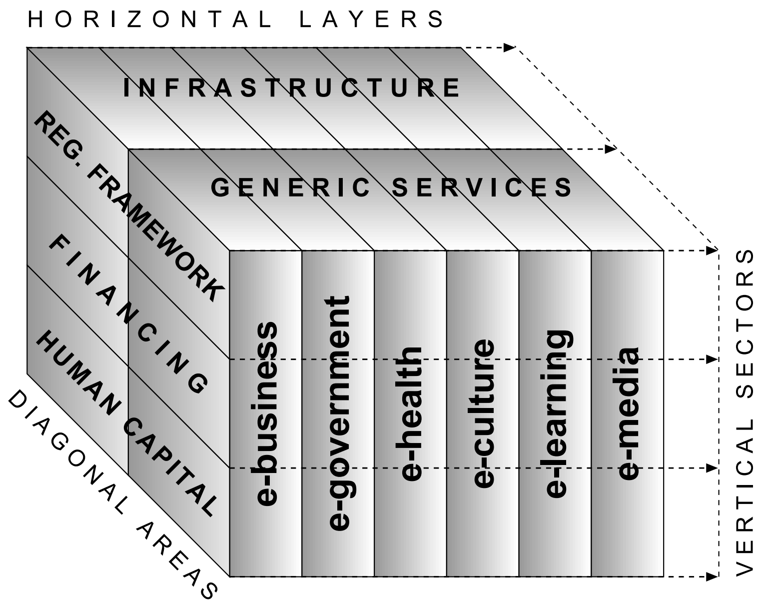
The first requirement for "digital activity" is the physical Infrastructure (the "Net"). The expansion of computer networks, digital TV, digital cellular phones, telephone lines, fiber-optic networks, wireless networks, and all types of hardware, telecommunications and generic IP-services form part of this layer. Secondly, Generic Service applications are needed to make it technologically feasible to add value to the physical infrastructure. All kinds of software, Webhosting, browsers and multimedia applications fall into this category. Since the "Infrastructure Layer" and "Generic Service Layer" form the grounds upon which the process of digitization takes place, they are referred to as Horizontal Layers.

The technological foundations of the two Horizontal Layers (Infrastructure and Generic Services), are used as a foundation for digitizing information flows and communication mechanisms in different sectors of society (such as the business and commerce sector, the health sector, public administration, education, etc). These different sectors of society, which undergo the process of digitization, are built up vertically onto the horizontal groundwork and so are referred to as Vertical Sectors of an Information Society. Vertical sectors are the "application" of the technology, which provides the "content" of the networks in an Information Society. The focus of Vertical Sectors is on "digital processes", as opposed to the focus on "digital products" in the Horizontal Layers. The fact that information flows and communication processes take place through electronic networks in a given sector, is usually identified in literature by adding an "e-" as prefix. There are many different "e-Sectors". The process of digitization is definitely most advanced in the business sector (e-business), although other sectors of society can greatly benefit from digitization (such as e-government, e-health, e-culture, e-learning, e-media). In this book, these six Vertical Sectors will be examined, given the advanced stage of their development and their significance for and relevance to developing countries. However, it is important to underline that the expanding process of digitization is not exclusively restricted to the six sectors selected for this book. The list of Vertical Sectors could be extended to other important fields of interest (such as e-democracy, e-security,[2] e-entertainment, e-banking, e-payment, e-research, e-tourism, etc.) (see dashed arrows in graph below).

2 A broader understanding of the term e-security would also include environmental disaster prevention and the use of digital networks to support fire fighters and to fight crime.

Besides the different Horizontal Layers and Vertical Sectors, it becomes clear that the process of digitization must be backed up by a number of interrelated fields, without which the formation of digital organization in an Information Society might otherwise bottleneck. Such fields cross over into different areas that belong to both Horizontal Layers and Vertical Sectors. These Diagonal Areas include setting up a regulatory framework that adequately embraces and fosters the new forms of behavior, financing mechanisms that help spread these technologies, and, human capital as the driving force behind the technology.

HORIZONTAL LAYERS, VERTICAL SECTORS AND DIAGONAL AREAS
OF THE INFORMATION SOCIETY



Source: Martin R. Hilbert

Even though this conceptual framework might seem very complex at the beginning, it is very useful to recognize and identify interdependencies and the direction and causality between the different layers, sectors and areas. This allows it to function as a tool that helps identify eventual bottlenecks in the different fields and in the development of adequate policies that encourage the transition towards an Information Society. Such a analysis can be drawn up along the different lines marking the intersections of particular “layers”, “sectors” and “areas”. It also enables to demonstrate how the different fields relate to each other.

The conceptual framework allows, for example, to structure complex issues like the notorious "Digital Divide", which generally refers to the gap between the ones who are included and the ones who are excluded from the new technology-based paradigm. The Digital Divide clearly originates in the Infrastructure Layer (Horizontal Layer), specifically in the physical access to the Net. However, it also extends to the Generic Service Layer, since ICT access is a combination of telecommunications-, hardware- and software availability, performance, pricing and usage. Inadequate software tools can be a major obstacle.

Such issues have an impact on the behavior of all the different Vertical Sectors. The lack of affordable infrastructure or the lack of adequate digital service programs can contribute to a Digital Divide throughout the e-business sector, the e-government sector, the e-learning sector, etc. However, the discussion can also center on the Digital Divide inside one specific Vertical Sector (such as connectivity in companies (e-business), schools (e-learning), hospitals and clinics (e-health), public institutions (e-government), etc.).

In order to bridge the Digital Divide, all those with a stake in the Information Society need to develop and implement strategies to create the interrelated fields that "diagonally" cross through all the Infrastructure and Generic Service Layers and the different "e-Sectors". Such policies must ensure the establishment of an adequate Regulatory Framework, that takes into consideration all the requirements of the different Horizontal Layers and Vertical Sectors (as for example is the case of intellectual property rights issues). However, regulatory aspects may also focus on a specific field, for instance the regulation of the "Infrastructure Layer" (e.g. telecommunications regulation, regulatory issues regarding technical standards, etc.). On the other hand, the regulation of standards for example, also relates to the "Generic Service Layer" (e.g. open vs. proprietary software, etc.). Furthermore, the Regulatory Framework touches all different Vertical Sectors. Legislation relating to digital signatures and electronic certificates can cause bottlenecks in development in every single Vertical Sector. Moreover, special legislation may be required for particular Vertical Sectors (such as in the case of special privacy laws in e-health, etc.). The same reasoning is valid for Financing mechanisms. In order to narrow the Digital Divide, resources need to be mobilized from the public and the private sectors to finance the development of both Horizontal Layers. Investments in infrastructure and software services are indispensable for building an Information Society. However, the process of digitization in the various Vertical Sectors also requires financial support (e.g. Venture Capital in the e-business sector). Last but not least, Human Capital and training aspects are omnipresent and absolutely necessary in the move toward an

Information Society. Suitable professional profiles must be identified in order to help build-up every single industry in the Horizontal Layers as well as the different Vertical Sectors.

In summary, ICT-Infrastructure and generic digital services form the technological groundwork on which to build an Information Society. The Horizontal Layers are necessary, but not sufficient on their own. By including different Diagonal Areas one is able to identify the issues that require adjustment under the existing conditions and to find policies to support the creation of an Information Society. The various Vertical Sectors show the different sectors that are subject to change. By analyzing them, the advances made toward an Information Society can be demonstrated.

Specific markets, institutions and other players can be identified in each of the Horizontal Layers, Diagonal Areas and Vertical Sectors. Each of them makes up a dynamic system, which reflects the technological, historical and organizational characteristics of the field. Similar to the long-standing model of "industrial organization", every one of the different Horizontal Layers and Vertical Sectors can be distinguished by specific rules, structures and laws, which determine their functionality. The different actors each search for adequate responses to the particular market regime in which they operate, while the interdependency among the different Layers and Sectors mutually influences their performance and development. Hardware development in the Infrastructure Layer for example, influences the pace of software development in the Generic Service Layer. In turn, the performance of the Infrastructure and Generic Service Layers, affects development in the Vertical Sectors. However, developments in those Horizontal Layers may have different effects on the e-business sector, the e-health sector and the e-learning sector, etc. Between the Vertical Sectors, a customer relationship management (CRM) business model from the e-business sector for example, might be adopted for e-government purposes, etc.

Furthermore, the players and institutions in the different Diagonal Areas can have a decisive positive or negative effect on the development of the various Horizontal Layers and Vertical Sectors. On the other hand, Diagonal Areas can also behave reactive to developments in the Horizontal Layers and Vertical Sectors. For instance, inadequate digital signature laws in the Regulatory Framework Area can bottleneck the development of the e-business sector, while the immaturity of a national e-business sector may provide little incentive for a government to push digital signature legislation, etc. Also here it is important to highlight that actions taken in the Diagonal Areas can have a different impact on and significance for the various Horizontal Layers and Vertical Sectors.

As with the "industrial organization" model, the dynamics that form the interrelationship between the different fields, are characterized by uncertainty, incomplete contracts, irrational behavior, spillover effects and other deficiencies and 'market failures'. An open dialogue between the different players, institutions and organizations from all the different Horizontal Layers, Diagonal Areas and Vertical Sectors is absolutely necessary for mastering the complex task of "building an Information Society". Since the characteristics of every particular field vary in different regions and countries, there is no "one size fits all" recipe for the transition towards an "Information Society". The "optimum transition path" depends on country and region-specific particularities. In order to support the necessary dialogue on a regional level in Latin America and the Caribbean, the third part of the book (Chapter V) proposes an agenda with concrete policy actions to encourage the creation of an Information Society in the region.

Chapter I

Theory and strategy

A. Towards a theory on the information society

All human behavior is based on the exchange of information and communication. Communication can take place through many different channels. Voice, text, gestures, movements, expressions, affection and even lack of attention transmit some kind of information. After all, for human beings "it is impossible not to communicate" (Watzlawick, Beavin and Jackson, 1990). Increasingly more and more human communication can and is being digitized. This process started a few decades ago and is accelerating as technological solutions evolve. These technological systems are commonly referred to as modern Information and Communication Technologies (ICT). The deployment of ICTs has a significant impact on how information and codified knowledge are handled and disseminated throughout the world. The "Information Society" and the "knowledge-based Digital Economy" are direct results of this information and communication evolution.

The concept of the "Information Society" is very complex. Intellectual thought will need to reduce this complexity through abstraction, whereby 'reality' is expressed in terms of specific entities and their relationships to each other. Words and schemata need to be found in order to discuss the concept of an "Information Society". This chapter establishes a theoretical framework, which helps to structure and untangle the concept of the Information Society. It also presents a way to structure digital activity based on the fundamental characteristics of ICT,, therefore helping to identify both the potential and the limits of ICT especially as a development tool.

1. Information and knowledge

When referring to the Information Society and the "knowledge-based Digital Economy", it is important to make a clear distinction between what we mean by information and knowledge. Although these two concepts may be interrelated, they are not the same thing.

THE KNOWLEDGE PROCESS

Knowledge can be a skill. Playing football, reading a foreign language or using a machine is knowledge. It is a tacit, habitual process, which is intangible and "carried inside" an individual or a community. Secondly, knowledge can be codified in order to transmit it. A manual about how to use a machine or a textbook about learning to speak a foreign language can be in written form. To use knowledge it has to be tacit and internalized However to transmit knowledge from one to another, it needs to be codified, which means it needs to be made tangible and static.

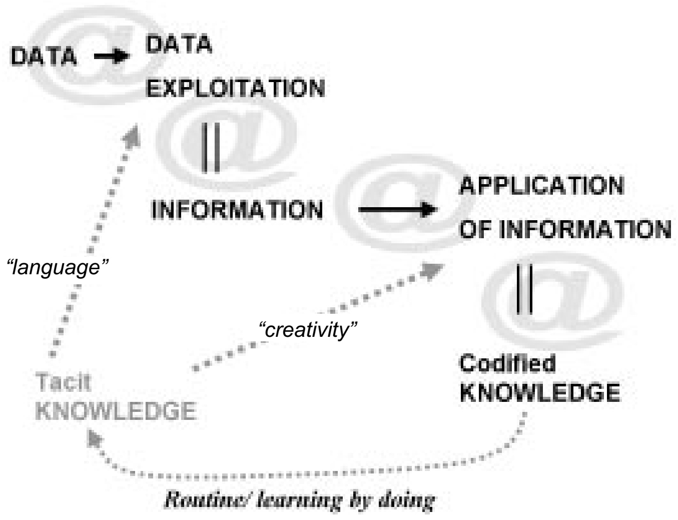
Codification of knowledge means reducing and converting it into a format that is compact and standardized (information). There are many different forms of codification. For example, smoke signals, wall paintings in caves, writing or Morse code are all forms of codification, just as language itself is a very common way to codify and transmit ideas and thoughts. Codifying knowledge allows the storing of information or the transmission of knowledge from one to another, directly or through "information infrastructures". This infrastructure might operate "manually" —such as through pony express, pigeon mail, the traditional mailman, etc.— or by further codifying information with another technical language (e.g. Morse codes or TCP/IP) and transmitting it through a communication system.

Different techniques and languages are used to codify information into data (words are codified into letters and letters are codified into bits through IP). By making use of previously learned —or programmed— techniques or languages, data can be de-codified and information be reobtained. When receiving an email, an informatic program is decoding and organizing the data, converting it into letters. In the subsequent process of "reading a human being decodes data (letters) to obtain information in the form of words and sentences. Learning these languages enables the decodification of transmitted data and its conversion into information.

However, deriving information from this data is not the same as obtaining knowledge. Only once information is put into context, in other words once it can be understood, associated, and made use of, can this creative application of the internalized information obtained be recognized as knowledge. By frequently consuming codified knowledge, a learning process begins which facilitates the creation and use of tacit knowledge.

(continued)

The Knowledge Process (concluded)



Tacit knowledge is the result of an apprenticeship (Arrow, 1962). "Learning by doing" is the result of repeated interaction (Nelson and Winter, 1982). Through this interaction, codified knowledge is internalized and tacit knowledge is created, which in turn helps the exploitation of data, and the application of new information. This virtuous circle brings about a high degree of interdependency between these two forms of knowledge, which make up what is called the "knowledge process".

While different language-supporting technologies and programs can help in the first step of decoding data, the second step of putting information into context, is a completely subjective one, and largely depends on the tacit knowledge applied. Spontaneous creativity and association mechanisms, which are based on prior training, are put to use. During this process of codification and de-codification, part of the knowledge might get "lost" or misinterpreted. However codification is indispensable for knowledge transmission, since it is not possible to connect two brains directly.

Source: Martin R. Hilbert

It is not possible to "transfer knowledge" over the digital infrastructure of ICTs. Furthermore, it is not even possible to "transfer information". All that can be transferred is data. Data is information that has been translated into a form that is more convenient to move or process. Numbers and letters are data that are codified by language and which can be transferred with the help of a book. In terms of today's computer and transmission media, data is information converted into binary digits.[1] The process that leads from "data", to "information" to "knowledge", is a dynamic process of codification and de-codification and a learning process.

Literature distinguishes between two forms of knowledge: tacit knowledge and codified (or explicit) knowledge (Polanyi, 1962). The distinction refers to the degree to which pieces of knowledge can be written down (codified) and transferred (Lundvall, 1997) (see Box "The Knowledge Process").

Tacit knowledge can be carried by an individual or by a community. The tacit knowledge of an individual worker is often referred to as "human capital". The tacit knowledge in a community is habitual and is made up of a set of concepts and definitions that allow predictable interactions to occur between the people of the community. Customs, habitual forms of interpreting behavior and accepted mechanisms of understanding each other reduce uncertainty, minimize the potential of conflict and assure that the entire community interacts in a productive manner. Tacit knowledge is sometimes termed "institutional-" or "organizational knowledge", or "social capital" (Cox and Putnam, 2002). Both forms of tacit knowledge (individual and community) occur as the result of a learning process (see Box "The Knowledge Process").

ICTs are very beneficial for codifying knowledge as well as transmitting and storing codified knowledge. By being able to transmit and store knowledge ICTs are crucial for acquiring knowledge for both individuals and society.

Looking first at knowledge codification, there is undoubtedly an increasing trend of knowledge codification and digitization. Throughout history people have tried to store and transmit information through many different technological means. People have also always tried to codify as much knowledge as possible and have used technological systems to make it widely available for commercial purposes.[2] The Information Society is progressively digitizing more and more areas. Knowledge is being incorporated through informatic applications, for example, and information is being stored and transmitted as part of this ongoing digital process.In a

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1 A bit (binary digit) is the smallest indivisible unit of digital information- either a one or a zero. Although computers usually provide instructions that can test and manipulate bits, they generally are designed to store data and carry out instructions in bit multiples called bytes. In most computer systems, eight bits form a byte.

2 For example "calculating" was once seen as pure tacit knowledge. Later on, mechanic and electronic calculators codified a large part of this formerly tacit knowledge and embodied it into technological systems.

recent study, IBM estimated that the number of "bytes" which "exist" in the world's networks and microprocessors, will increase a million-fold between 2001 and 2010 (from 1 beta-byte to 1,000,000 beta-bytes) (IBM, 2001). While the methodology and the accuracy of the statistics of this study are open to question, it still illustrates the explosive trend of digitization.

Secondly ICTs influence the knowledge process by helping communicate and transfer large amounts of data with ever increasing reach, speed and scale. ICTs therefore help accelerate the knowledge process and tacit knowledge creation. This knowledge created includes institutional and organizational knowledge (social capital), as well as individual knowledge. Naturally the rate at which different kinds of codified information can be transferred over the open-architectural and global channels of the network of networks (the Net) in real time, affect the speed of progress and development. Clearly the rate of knowledge creation (see Box "The Knowledge Process") is dependent on the flow of information and vice-versa. This interdependency of information and knowledge creation often leads many to conclude that "the world seems to spin faster now", due to a "digital nervous system" that spans it (Gates, 1999). The following two sections take a closer look at the characteristics and the dynamics of this digital nervous system, before focusing on the interesting question of what this technological system can contribute to the process of development.

2. Information and communication technologies (ICTs)

Before World War II, engineering and scientific research and inventions focused on extending man's physical rather than mental power. After the war, the focus of scientific research and development turned to the "massive task of making our bewildering store of knowledge more accessible"[3] (Bush, 1945). This led to an intellectual revolution —initially concentrated in the United States— which began with a growing sense (firstly restricted to a segment of the scientific community), that existing paradigms no longer adequately addressed the problems posed by an environment that they partly created. A new scientific paradigm emerged[4] (Kuhn, 1962). Paradigms set the basic framework for how things are perceived. Paradigms are like wearing "red glasses". The entire world appears red to the person who is wearing these glasses. A change in these

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3 "Just as the steam engine and electricity enhanced physical power to make possible the industrial revolution, digital … breakthroughs are enhancing brain power." (UNDP, 2001)

4 "Close historical investigation of a given specialty at a given time discloses a set of recurrent and quasi-standard illustrations of various theories in their conceptual, observational, and instrumental applications. These are the community's paradigms, revealed in its textbooks, lectures, and laboratory exercise." (Kuhn, 1962).

paradigms is like a change in the color of the glasses. One of the major trends in scientific development in this period of paradigm shift, is the focus on knowledge and information systems and processes vis a vis other mechanic and motorized systems and processes. The new emerging information-focused paradigm has created awareness and extensive discussions about the "Coming of Post-Industrial Society" (Bell, 1973), and eventually led to what is nowadays referred to as the "Information Society". In the early 1950s it was often argued that if technology was properly developed it would give man access to and "command over the inherited knowledge of the ages" (Bush, 1945). The new scientific paradigm called for this technology to be implemented and the stage that Kuhn —in his "Structure of Scientific Revolutions" (1962)— condescendingly called "puzzle solving" began. Using science to work on solving this problem created new technological solutions, the so-called Information and Communication Technologies (ICTs). These technological systems brought together three different technologically evolving paths in a process that is often referred to as "ICT-convergence".

One of these three technological systems traditionally focuses on transmitting and storing information. Storing and spreading information and having the technology to do so has long been recognized as being very important for human development. For example, a very traditional and popular way of spreading information is through books. This started with the Chinese invention of paper (usually cited 105 A.D.) and spread even faster with Gutenberg's innovative invention of the printing press[5] (mid-1450s).

A second of these technological systems is the emerging network of systems that focus on communication processes. Unlike the first of these systems, communication systems are not as focused on transmitting vast amounts of information, but rather on transmitting small messages quickly, over large distances. There is often a fine line between information systems and communication systems, which is often even neglected in literature. There are various technical solutions, which can be used for both communication and information services. This is due to the similarity in the definition of the words "communication" and "information". The "exchange of information" can broadly speaking be defined as "communication". Communication is paramount, since it keeps the knowledge process in motion (see Box above "The Knowledge Process").

A third technological path is informatic service tools and computers. For centuries humans have sought technological solutions which help to process

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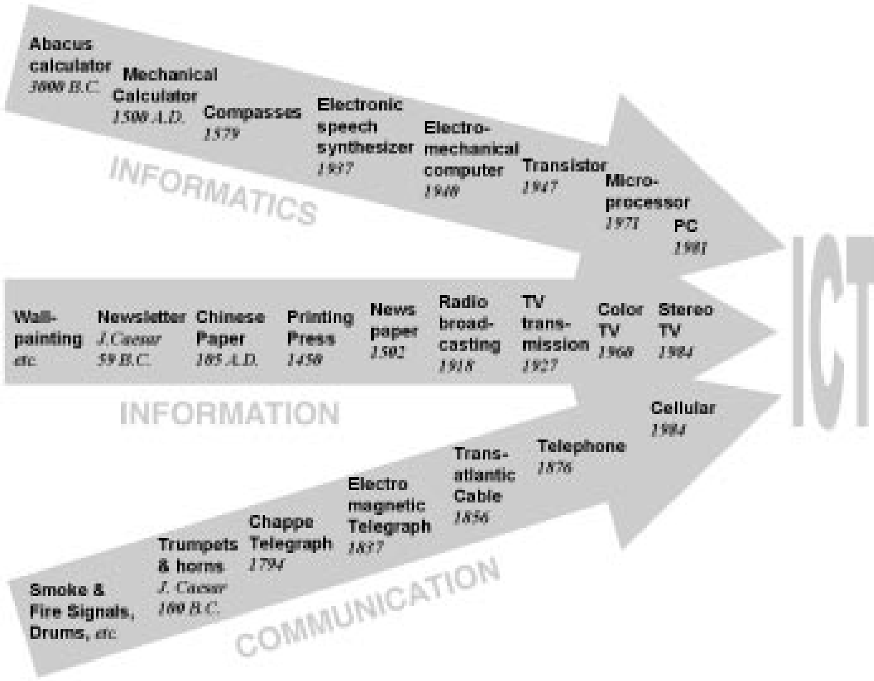
[5] By many considered the "most important invention of the past millenium".

information incorporating formerly tacit knowledge and skills. In the mid-20th century these solutions advanced in leaps and bounds. Basic tools and skills, which were used for centuries to complement "brain work" (such as the abacus, the geometric triangle or compasses), suddenly started being replaced by electronic devices. The invention of the transistor and the microprocessor introduced new dimensions of information working through informatic tools.

ICT-CONVERGENCE



Note: Dates in this graph as well as the inventions selected may be subject to historical discussion.

Source: Martin R. Hilbert

The convergence of (1) informatic and computer systems, (2) content carrying information systems and (3) communication systems, is generally referred to as Information and Communication Technologies (ICTs) (sometimes also 3C: Computers, Content and Communication (Tapscott, 1996)). The convergence of the three introduced a new technological paradigm regarding the way information is processed, the way communication takes place and the way knowledge is passed on.

In contrast to the invention of paper and Gutenberg's printing press, ICTs not only enable information to be stored and spread but also to be exchanged in "real time" (communication). A good example of this process of convergence is television. Although information has traditionally flowed in only one direction (broadcasting television), the convergence with the "communication evolution path", allows information to flow in both ways, for example digital television. By adding informatics to the process of ICT convergence (for example a translation software), this means that a person can now read a book (information) in a foreign language (through informatic solutions) and comment on it in "real time" (communication), through ICT infrastructure. The process of ICT-convergence has a tremendous impact on the nature of human activity and on the dynamics of knowledge.

Interestingly, both information providing systems and communication systems are built on similar architecture. Firstly there is the (1) physical infrastructure, which serves as "hardware" that enables information to be carried (the physical paper-based book or letter, for example). Secondly (2) there is a language that allows the standard exchange of information (in forms of letters or drawings or Morse-codes for example). Thirdly (3) a certain structure is needed, which enables the efficient use of the content (in a dictionary it would be an alphabetical list of contents, a newspaper would be structured by headlines, etc.). Lastly there is the (4) final content which is transmitted (for example a textbook, a dictionary, a children's book, a comic, a love-letter or a declaration of war, etc.).

Also ICTs can be identified by four different layers. They consist of: (1) "the Net" (the infrastructure); (2) A language which enables communication, i.e. the transformation and re-transformation of information into data in order to enable transmission (binary digits over Internet Protocol IP, controlled by TCP); (3) "The Web", which structures communication and coordination mechanisms through hypertext links and (4) the final content, which is the information to be transmitted. The "technological paradigm" (Dosi, 1982), which is introduced by the usage of modern Information and Communication Technologies (ICT), impacts all four layers:

(1) The infrastructure: All kinds of electronic equipment get connected to fixed, wireline, wireless or mobile networks. This equipment has an immense and ever increasing capacity for information storage. The resulting network is built on constantly increasing bandwidth, maximizing communication capacity. This decentralized network of networks (the internet) has a "worldwide reach in "real time".

(2) The language of information codification is altered: Besides spoken and written language, digital service tools and software also enable the transmission of images, sound, movement, entire videos, codified smells, holographs, etc.;

(3) The structure of communication and coordination mechanisms —the way information is structured, organized and handled (through dynamic, non-liner networks)— brings about organizational changes.

(4) The content transmitted: The storage, spread and exchange of information in real time are part of many activities that take place in a society. Therefore modern ICT can be deployed generically for many different purposes and in many different sectors: commerce, health, government and public administration, education, military, civil society activities, etc.

3. The four layers of digital activity

As a direct result of this architecture of modern ICT, different Layers[6] can be derived, which help to structure the concepts of an "Information Society" and a "knowledge-based digital economy". Each one of these Layers is characterized by specific structures, institutions and actors, which determine its functionality. Some of the particularities of the different Layers will be discussed in this section.

The first Layer is referred to as the "Infrastructure Layer". The build-out of a computer network, telephone lines, fiber-optic networks, as well as wireless networks and all kinds of hardware and telecommunications make up this Layer. On the one hand it is the physical embodiment of "the Net" and on the other hand it is data traffic and the governance of the digital infrastructure. The main actors involved in this layer include telecom operators, such as Telefonica, Telecom Italia or AT&T; electronic companies such as Ericsson, Lucent or Sony; equipment producers, such as Nokia, Palm, IBM or Compaq; as well as generic service providers such as AOL and UOL; and Internet governance and steering committees-such as ICANN (Internet Cooperation for Assigned Names and Numbers) or ARIN (American Registry for Internet Numbers). In Latin America, for example, the most widely spread infrastructure network is mobile telephony. At the end of 2001, there were 69.7 million digital cell phone subscribers[7] in the region.

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6 See also "The Internet Economy Indicators"; from Center for Research in Electronic Commerce, Graduate School of Business, University of Texas at Austin.

7 2G: GSM: 4.3 million; CDMA: 17.1 million; TDMA: 48.3 million; additionally 17.6 million analogue 1G users. 2G (second generation) is a term, which refers to mobile telecommunication, which is allowing voice and data transmission through a mobile network. Data transmission is slow and generally between 9.6 Kbit/s and 14.4 Kbit/s. 2G networks are getting gradually evolved over 2.5G (GRPS, EDGE) to 3G (UMTS, cdma200, etc.), which is then promising data transmission speeds between 400 and 2000 Kbit/s.

The second Layer is the "Generic Service Layer". Products and services in this layer build on the Infrastructure Layer network and make it technologically feasible to add value to it. All kinds of software producers, such as Microsoft, Oracle, SAP; Webhosting and Webdesigner such as Qwest and Latin-Host; as well as browser and multimedia tools, such as Netscape and RealPlayer, fall into this category.

The third Layer, the "Intermediary Layer", increases the efficiency of electronic markets by structuring communication in a certain way. This layer facilitates the meeting and interactionof online activities. Horizontal and vertical portals, such as Yahoo or Google, and electronic market places, such as Ariba or Mercado Electronico are considered as intermediaries. Governmental or civil society sites and international organizations often act as intermediaries as well.[8]

The fourth Layer is the "Fulfillment Layer". It digitizes part of the final performance-if not all of it. The fulfillment could take place in the health sector, in education and training, entertainment, for military purposes, for public administration, for civil society activities, etc. In the business sector, user segments differentiate participants of this Layer: B2B, B2C, B2G, etc.

While the Infrastructure and the Generic Service Layers have the characteristics of traditional industries, the Intermediary and Fulfillment Layers are more generic and penetrate existing sectors of society by digitizing them. The fact that part of the information flows and communication processes take place through electronic networks in the different sectors, is usually delineated in literature through the addition of an "e-" as a prefix (e.g. e-business, e-government, e-learning, e-health, etc.).

Taking a second look at the different Layers, it becomes clear that they are not static. Specific markets, institutions and actors characterize every one of these Layers. This creates dynamic and competitive systems, which reflect the technological, historical and organizational characteristics of each Layer and determine its behavior. Similar to the long-standing model of "industrial organization" in the different industries of an economy (which discusses pricing and cost structures, entry barriers, economies of scale and scope, market concentration, horizontal and vertical integration, differentiation, corporate conduct and forms of cooperation, hierarchical and matrix organizations, institutions, uncertainty, innovation, market

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8 See for example http://www.unsystem.org for a vertical portal. ECLAC set up a horizontal portal to connect social institutions in Latin America and the Caribbean in 2002: http://www.eclac.cl/dds/noticias/proyectos/6/7796/index.asp.

equilibrium and pareto conditions, competitive regimes in general, etc.), each of the Layers of digital activity is set up by rules, structures and laws, which govern the functionality of the Layer. Each Layer is searching for its own balance, while the interdependency of the Layers mutually reinforces progress. Some of the particularities that constitute the complex and vital regimes of each Layer will be discussed in the following paragraphs, while a deeper analysis of each Layer can be found in the different chapters of this book.

The Infrastructure Layer is certainly comprised of very dynamic and fast growing industries. Some Asia-Pacific countries achieved impressive growth rates by producing and exporting in these exploding industries. However, it should be remembered that hardware production does not directly nor automatically lead to progress towards an Information Society or a Digital Economy.[9] For example, it is interesting that countries with a very high production of ICTs, like Korea, lag far behind in electronic commerce, whereas countries with virtually no domestic ICT production sector, like Australia, are on the forefront of electronic business behavior (OECD, 2001b). In Latin America, it is estimated that e-commerce, or rather the use of the technology, will in the near future be far more important than the production of the technology. Production of communications equipment, computers and office machinery in Latin America's high-tech manufacturing industry reached US$ 29 billion in 2000 (1.5% of GDP), while e-commerce transactions in that region are estimated to surpass that amount in 2003 and grow at a much faster rate (eMarketer, 2002). Therefore at the moment the greater focus is on using the networks in Latin America, and less on producing the technology.

A decisive factor in information and communication networks is the so-called network externalities (also called network effects). They play a fundamental role in digital market behavior, whereby the value of a product or service of a network increases by (X^2-X) with each new user connected to the network.[10] The existence of network externalities in the Infrastructure

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9 Obviously the knowledge component of the hardware industry is very large and decisive. Experience shows that all successful hardware producers work with the help of highly sophisticated electronic networks themselves, keeping up a high information flow, through modern information processing technology. But this is similar to every knowledge intensive industry and R&D (e.g. pharma), and should analytically not be confused.

10 Often "networks externalities" are described with "Metcalfe's Law", which states that "the value of a network increases exponentially by the number of users connected to it". However, stochastically this equation (value of network=X^2) does not make sense, since it would not create value to connect with yourself. Therefore it should be (value of network= X^2-X).

Layer distorts rational market mechanisms in other Layers. For example, they usually lead to a classic "chicken and egg" scenario between content providers and the number of users of digital networks. With a small amount of users in a digital network, there is little incentive to create a lot of content (sophisticated WebSites, etc.), while the lack of content does not favor an increase of users, etc. Once a "critical mass" of users or content is reached, the vicious circle between usage and benefit often explosively expands into a virtuous circle of massive proportions. This process speeds up with the power of network externalities.

The process of ICT-convergence is most visible in the Infrastructure Layer. While convergence in the Generic Service Layer is rather "invisible", the convergence of end-user equipment is far more apparent. The most concrete example may be the current mobile telephony market and its merging with PDAs and Laptops. But also the appearance of the traditional television set is changing, as it converges with the traditional Internet. Technological terminals become increasingly distinguishable not by the type of service for which they are destined, but by their attributes such as "portable" or "fix", for "individual" or "collective" use, or with a certain level of "resolution" and "audio quality" or "memory". The power that Schumpeter (1934) coined as "creative destruction" is very strong in the Infrastructure Layer. Some of the products substitute each other, while others complementary to each other. People have even tried to illustrate the pace of creative destruction in the Infrastructure Layer through specific "laws". The often cited "Moore's law" (the capacity of a microprocessor doubles every 18 months; valid since 1971) or "Cooper's law" (the efficiency of radio spectrum usage doubles every $2^{1/2}$ years; valid since 1895) demonstrate the speed of innovation in the Infrastructure Layer. The rate at which infrastructure becomes obsolete and the degree of uncertainty about the rate of technical progress are high in the markets of this Layer.

The Generic Service Layer is going more in the direction of making use of "Inter-networking" and the idea of managing knowledge digitally. This is not a very new idea. The software-industry survived its first three decades of existence with a limited number of business models. The first digital service tools were designed for military use and later for commercial use at the corporate level.

DIGITAL SERVICE TOOLS IN A DIGITAL ECONOMY

The first complete solutions for commercial use were software programs that focused on the necessities of the production process per se, and had very limited scope. These so-called MRP (Material Resource Planning) systems evolved in the late 1960s. With the advent of digital networks, more advanced programs emerged, based on the idea of making all the important units within a company communicate by sharing the same data in real time. While systems of this type were credited with important increases in administrative efficiency, these so-called MRPII were still prohibitively expensive and only ran on a limited set of mainframe computers (1970s). With the arrival of the PC and the server-client system of the emerging Internet (1980s), so-called ERP (Enterprise Resource Planning) software was introduced, representing a complete information management system inside a company. Since then, ERP programs have been building a network business model around themselves, which are based on the degree of connectedness to information and communication technologies which transform them into an expansive and pervasive framework that touches every aspect of business administration. In the incoming value chain SCM (Supply Chain Management) software is creating and controlling vast procurement networks, while in the outgoing value chain every customer receives special attention through CRM (Customer Relationship Management). Business Intelligence (BI) is gathering, managing and evaluating all the information related to a company's electronic network, aiming to ensure that the maximum benefit is taken from all data and information that flows inside the company, by bringing it to the right place, at the right time. By interconnecting these programs inside the company and integrating them into an inter-firm "real-time" network, demand and supply are networked, digitizing Walras's Law of Markets (Walras, 1874). This is happening through "closed" electronic networks (like EDI) or open ones (the Internet). The following Graph shows how digital service tools build the central nodes in a networked Digital Economy.

Source: Martin R. Hilbert

Nowadays, digital service tools are found in all shapes and sizes. They invade the entertainment industry, public administration, the health sector and educational organizations. Technological advancements, such as voice-to-data and data-to-voice programs, or sufficient bandwidth for videoconferences, open up a whole new spectrum for the development of digital service tools.

Technical standards, which are systems, configurations, interfaces, methodologies or procedures that act as a tool to enable and ensure access to services, and their portability, interoperability and compatibility, are fundamental to the Generic Service Layer. Interoperability between the different technological solutions is paramount, in order to defend the open idea behind the "Inter-net", and not to create closed and separate information and communication circles.

Based on this model of electronic connectivity, the Intermediary and the Fulfillment Layers bring about a change in the organizational structure of a given sector. They refer to "digital processes", rather than "digital products". The Intermediary Layer provides coordination mechanisms. It creates a certain order and enables structured behavior. Its activity is also referred to as "info-mediation" (Hagel and Singer, 1999). The importance of the Intermediary Layer is growing with the complexity of interconnectivity. For unconnected Information Technology (like an individual computer), the Intermediary Layer does not exist. However it is paramount for efficiency in interconnected digital networks. Such bi-directional real time networks also create entirely new scenarios of interactivity and participation. Dynamic pricing mechanisms may be one of the most impressive examples of interactive interconnection through an intermediary.[11] In the Fulfillment Layer, communication and coordination mechanisms of human activity —which could be of economic or social nature for example— are carried out digitally. Trading stocks online, interacting through digital TV, tele-medicine distance treatment, email protest letters, online tutoring or online tax paying all fall into this Layer.

Many different sectors in society (such as the business and commerce sectors, public administration, the health sector, educational institutions, civil society organizations, etc.) make up their own Intermediary and Fulfillment Layer. Even though both Layers play different roles and pursue different goals, the particular intermediary greatly depends on the specific sector of fulfillment. An intermediary in the educational sector (e-learning) differs significantly from an intermediary in the commerce sector (e-commerce), for example. For this reason, the Intermediary and Fulfillment Layers are not treated separately in this book and are subject to an integrated (sector-specific) analysis. For reasons of development policies, it is more important to examine the behavior of the different sectors that are subject to the process of digitization (e-business, e-government, e-health, etc.), rather than focusing on theoretical aspects of digital intermediation and digital fulfillment. Therefore, the process of digitization is presented in different sectors ("Vertical Sectors of an Information Society"), which cover both, sector-specific intermediation and sector-specific fulfillment.

Digital activity in such vertical sectors brings special characteristics with it (Negroponte, 1995; Kelly, 1998). In order to analyze these characteristics better, a concept of digitality —regarding goods and services— has emerged. This approach distinguishes between "digital goods" (also "digitized goods") and "non-digital goods" (U.S. Department of Commerce, 1998; 1999; Hilbert, 2001b). Mainly due to the low distribution costs of digital goods, the trend seems to be going toward digitizing everything that can possibly be digitized. This is basically everything

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[11] In contrary to fixed mass pricing, dynamic pricing mechanisms enable individualized, or at least real time supply and demand adjusted product prices (Hilbert, 2001b).

consisting of what is understood as "codified knowledge" or "information". It is impressive how many "things" can be digitized;music, software, magazines and books, airline and entrance tickets, stocks and movies to name but a few. Even something as old and familiar as "money" has been becoming digitized for a long time e.g stocks and plastic money, credit cards). The trend is expected to continue until every "coin" will be represented by digital data, transmitted over wireless, mobile networks between portable electronic wallets in real time (e-payment).[12]

Digital goods and services have many special characteristics. Both can be transmitted through a packet-switched system around the world in real time. The difference between digital goods and digital services, is the rivalry of digital services. The concept of rivalry and non-rivalry distinguishes between products that can be used up, and products that cannot be used up, respectively. Non-rival products can be duplicated at zero cost, while a service (which is rival) requires new "input" to perform again. Given that the cost of duplicating a digital good is almost zero (non-rival), they spread extremely fast on a global scale. The music file-sharing software Napster reached more than 38 million users worldwide (10/2000) in less than a year. This was the fastest growing "global invasion" of a tool, ever documented. Regarding the example of digital music file-sharing systems, it is clear that non-rival digital goods also present a major challenge for defenders of intellectual property rights regimes.

Furthermore, digital data packets that are exchanged over the global information infrastructure, do not recognize geographic borders. The "death of distance" (Cairncross, 1997)[13] with regard to digital goods, has the potential to better integrate geographically disadvantaged countries[14]. However, it also is breaking down every form of informal industrial protection, which until now sheltered local industry in the developing world. Powerful suppliers from the developed world now can reach individual households in developing countries through digital infrastructure. This direct and

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12 The first evidence for this is apparent, as in many countries payment applications through cellular telephones are already being used. By sending SMS a client can pay for his Metroticket, or can of soda with a simple 2G cell phone.

13 In 1995, The Economist published an influential and thought-provoking article by Francis Cairncross entitled "The Death of Distance". It dealt with the impact the advances in telecommunications and the Internet were having on distance: "The cost of communications will probably be the single most important economic force shaping society in the first half of the next century…".

14 The Chilean government is emphasizing the importance of this fact, due to its geographic marginalization. President Ricardo Lagos in 2000: "In the digital world, there are no longer countries at the center and others on the periphery. Some observers have proclaimed the death of distance." ("The country we want", www.gobiernodechile.cl).

worldwide competition in markets involving digital goods can have devastating consequences on local industries, but can also open new markets for developing countries.

4. ICT for development

Within the conceptual framework of the Infrastructure and Generic Service Layers and theVertical Sectors of the Information Society, there are two different strategies for using ICT for development. Some countries focus on building out a competitive industry in the fast growing ICT production sectors (Horizontal Layers). Much emphasis is put on the production of hardware or software. Some small countries boost exports in these sectors (for example Costa Rica and Taiwan). Some large countries try to build up domestic capacity (for example Brazil, India and China) (UNDP, 2001). The hardware and software industries have been growing tremendously over the recent decade, and therefore have had an direct important impact on growth in many countries. In the US: ICT production contributed to 48 percent of GDP growth in 1991-95 and 56 percent in 1996-1999. In Costa Rica half of GDP growth in 1999 stemmed from ICT production (U.S. Department of Commerce, 1999, 2000b). However, as mentioned above, ICT production, especially when used for export, does not automatically imply progress towards becoming an Information Society or a Digital Economy. It is merely a fast growing industry.

Other countries are pursuing strategies that seek to use ICT as a means of broadening socio-economic development. Communication and coordination mechanisms are being increasingly digitized to raise productivity, mainly through increasing efficiency in the Vertical Sectors.[15] This requires institutional reorganization to advance communication practices towards the "digital age". Institutional reorganization affects informal behavioral norms, unwritten rules and agreements, habits, traditions and common forms of viewing the world. New forms of institutional and social knowledge need to find an "equilibrium" in digital activity. Over time society adapts to new ways of doing things which become part of normal habitual behavior. Once implemented at work, digital organization is highly effective. Digitization of communication and coordination processes can improve the efficiency of market mechanisms in an economy (see Box "Digitizing Market Mechanisms"), the efficiency of the health sector, of educational systems or public administration, among other Vertical Sectors.

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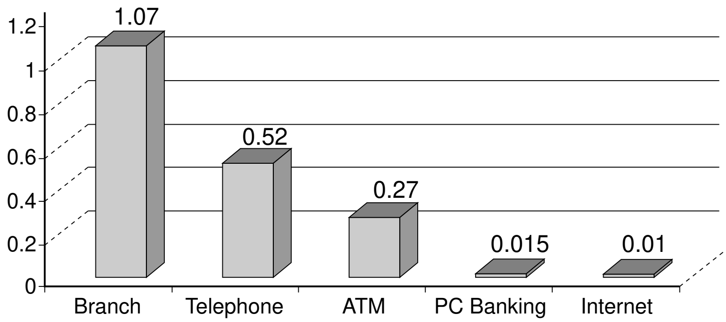
[15] "The key to benefiting form ICT is to focus on policies to foster its use, rather than its production." (OECD, 2001).

DIGITIZING MARKET MECHANISMS

The digitization of the flow of information and coordination mechanisms in the business sector, is designed to eventually digitize informal institutions, such as markets. A marketplace enables many kinds of sellers and buyers to meet, communicate and trade. Their own organizations are connected to this electronic network, as well as their suppliers and customers. The different systems exchange information in real time, communicating and coordinating business transactions. The digitization of communication and coordination processes that take place in marketplaces involves a structural change in microeconomic organization, and brings with it several advantages. First of all it reduces transaction costs. Online transactions are a lot cheaper than off-line transactions.

REAL COST REDUCTION: TRANSACTION COSTS IN US$



Source: Booz-Allen Hamilton, sited from U.S. Dept. of Commerce, 1999

Furthermore, the coordination of business deals can take place on a much larger scale, at faster rate (in “real-time”) and in a more transparent manner, with more information available. Sending a “request for quotes” (RFQ) for a product electronically to a B2B marketplace, which has a database of several hundred suppliers connected to it, certainly has its advantages over making hundreds of phone calls or personal enquiries about a product to a limited number of known suppliers. Digital markets are an advanced form of doing business. They are widely praised by the private sector for significantly raising productivity in their companies Huge and powerful transnational companies are the driving forces behind the creation of a Digital Economy, which is introducing significant changes in the functionality of markets and corporate conduct.

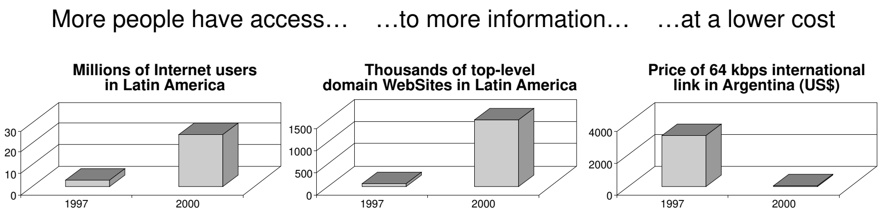
Source: Martin R. Hilbert

The broader concept of “development” is not restricted to economic activity alone. One of the most positive accomplishments of the past decade has been the acknowledgement that development has farther reaching implications than merely economic ones (Ocampo, 2001a). The fact that the impact of ICTs and digital practices has stretched into the areas of health, politics, public administration, education and advanced science, as well as into cultural, social and even religious activities, shows the potential that the current technology-based paradigm has for development.

Two main lines of thought help to explain the impact the ICT paradigm is having on development through digitization in the Vertical Sectors. The first argument regards the transfer of knowledge, that spurs from an increased flow of information. The second argument relates to the internal development of a society, due to better organization.

First of all, the increased flow of information raises the hopeof a decline in information asymmetry, by creating a historical opportunity to integrate all societies, by networking them in an universal Information Society (Hilbert, 2001c). More people than at any other time in history, now have access to an ever-increasing amount of information, at constantly falling costs (UNDP, 2001).

WIDESPREAD AND CHEAP ACCESS TO INFORMATION



Access to this information can help to create knowledge in different sectors of society. For developing countries this means they can advance closer in the direction of the existing "knowledge frontier" in educational and health standards, new business models, public sector administration and living standards in general. The increased flow of information both within a country and worldwide through digital networks, offers developing countries the chance to better integrate themselves into the global exchange of ideas.

According to conventional theory, economies with low living standards and poor growth rates suffer from an "object gap" (Romer, 1993a). They have insufficient physical and human capital. Traditional policy has recommended them to accumulate more capital of all sorts in order to grow and develop. New microeconomic-focused growth theory has introduced the notion of an "idea gap [which] directs attention to the patterns of interaction and communication" (Romer, 1993a). While the importance of accumulating capital is not neglected, it is becoming increasingly accepted in development theory that different stages of development reflect essentially differences in tacit knowledge existent in a society. This tacit knowledge can be technological knowledge about how to produce certain products and services, but it is also institutional knowledge in an economy and a society.

A simple hypothetical example illustrates that it is individual knowledge, as well as institutional knowledge, which drives growth. For example, if the earth were to return tomorrow to the physical state it existed in five thousand years ago, free from all the institutions, physical capital, and civil engineering projects there are today, but without losing the accumulated knowledge that exists, humans would recover the current standards of living in a matter of generations (Romer 1993b). Specific knowledge from the individual, as well as institutional knowledge that enable efficient coordination mechanisms to function, would be a basic requirement to achieve this. It is knowledge about the "way of doing things" that differentiates growth from stagnation. Besides the obvious lack of physical capital in developing countries, under -developed markets are characterized by an incomplete institutional structure, which lacks this kind of knowledge. The deployment and usage of a global network of Information and Communication Technologies is facilitating knowledge creation in developing countries.

This leads to a second line of thought on how ICTs can be used to boost development. During periods of paradigm transitions countries that are lagging behind have the opportunity to catch up. There is time for learning while everybody else is doing so (Perez and Soete, 1988). While all the world is digitizing communication and coordination processes in different sectors of the society, developing countries can make extraordinary advances in updating their existing institutional structure through digitization in the different e-Sectors.

The re-organization that comes from digital activity means introducing a new institutional setting. Institutional settings determine the form and trend that reorganization takes, as well as the "rules of the game". Institutional settings reduce uncertainty in everyday life by forming patterns of interaction and shaping the way individuals view and understand communication mechanisms. Institutions facilitate effective interactivity. They are a combination of formal rules, informal norms of behavior, conventions and codes of conduct, and the characteristics of how these are enforced (North, 1993).

An effective institutional structure is the key to growth and development. In fact, all rises in living standards can be traced back to discoveries of a more valuable order of "things" in the earth's atmosphere (Romer, 1993b). This is also the central lesson learned from the discussion about the famous "productivity paradox" in the 1980s and the hype about the "New Economy" at the end of the 1990s. It is not the number of computers that triggers higher productivity but overall changes in the way the economy works. While discussing the productivity paradox,[16] Paul David (1990) emphasizes that the effects of technological changes are most felt only after they have become incorporated in the institutional setting. It is claimed that it takes "decades" before organizations and markets are well enough equipped to incorporate the technological solutions in a productive way. The focus for economic growth and development is shifting from simply connecting to the Horizontal Layers of ICTs, to incorporating digital practices into the different Vertical Sectors as soon as possible.

However, the structure of formal and informal institutions is based on country and culture specific environments. These environments have an impact on the rate of change and there is often a degree of inertia, or slownessto change in certain countries. Path dependencies imply that institutional set ups cannot be copied and applied from one case to another entirely and also that they cannot be erected wholesale overnight. Following these general characteristics of institutional changes, also the process of digitization in the Vertical Sectors makes a domestic learning process indispensable.

Summing up, the ICT-paradigm proposes two different focuses for development. One is to produce and sell technology of the Infrastructure or Generic Services Layers. Another is to focus on digitization of information flows, communication processes and coordination mechanisms in the Vertical Sectors of a society. This can (a) diminish information asymmetries and supports the integration of countries into the global exchange of "ideas"; and (b) helps markets and institutional settings to function in developing countries. "Digitization" is a very powerful policy, given that inefficient institutions, lack of transparency and incomplete transactions are among the most regrettable obstacles for development in many developing countries.

In order to apply ICT and digital activity to development, it is necessary to firstly have a highly capital-intensive technological groundwork (Horizontal Layers) and secondly to find policies that impel countries to accelerate the adoption of digital activity, and to overcome the inertia of institutional re-organizations. Unless both of these requirements are achieved, the risk of falling behind (rather than developing) is very high.

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16 The discussion about the so-called "productivity paradox" started with the observation that productivity (Labor- as well as Multifactor Productivity) mysteriously slowed down in the US economy around 1973 and has remained sluggish over the 1980s-just about the time when computers came on the scene. In 1987 Robert Solow started the discussion with his famous quip: "We can see the computer age everywhere except in the productivity statistics" (Hilbert, 2001b).

5. Integrating the technological paradigm into a development approach

The ICT-paradigm and the concept of the Information Society are not purely about technology, but about humans who communicate through worldwide networks, who can combine their intelligence, increasingly exchange codified knowledge, and therefore make creative breakthroughs in wealth creation and social development. The use of modern Information and Communication Technologies (ICTs) and the subsequent process of digitization introduce an institutional re-organization with regard to the way information is transmitted, communicated and coordinated. The process of digitization stands for a technical change that is referred to in literature as a "meta-paradigm" (Freeman and Perez, 1988), a "technological paradigm" (Dosi, 1982) or a "techno-economic paradigm" (Pérez, 1983).

To unleash the far-reaching potential of this paradigm, it is indispensable to have technological groundwork. This groundwork consists of a physical Infrastructure and intelligent Service tools (Horizontal Layers). Both of these Layers are the combination of very dynamic industries, with each of them following a different model of "industrial organization". They are interwoven among themselves and interdependent on each other. In the Infrastructure Layer, for example, the development and functionality of the hardware industry is influenced by advances in telecommunications technology. The same way in the Generic Service Layer, WebPages and hosting services are dependent on progress in software or multimedia applications. Furthermore, the interdependency of both Layers is mutually reinforcing and shaping market behavior. Advances in bandwidth for example (Infrastructure Layer) provide a stimulus to the software and Web animation industry (Generic Service Layer). The strength of ICT-convergence heavily influences the actors and competitive regimes that determine the different industries involved in the Horizontal Layers of an Information Society. The "creative destruction" of ICT-convergence is introducing complex mechanisms that substitute and are complementary in its markets.

Similar to other technological systems, the Infrastructure and the Generic Service Layers revolve around very capital-intensive industries. In order to promote the growth of these layers it is necessary to draw up sophisticated strategies to finance and regulate the industries built around them. Furthermore, creating and maintaining these industries requires adequate amounts of human capital.

The purpose of deploying Infrastructure and Generic Service Layers is to digitize information flows, communication processes and coordination mechanisms in different sectors of society. Almost every social and economic activity carried out in a society requires the processing of information and communication, many of which can be digitized. In the economic sector (e-business), in public administration (e-government), in healthcare (e-health), civil society activities (e-culture); in educational mechanisms (e-learning) or the information and entertainment industry (e-media) many of the information and communication processes are already being subjected to digitization.[17] By taking a closer look at the different Vertical e-Sectors of an Information Society, it becomes clear that all of them share similar characteristics of digital activity (death of distance, real-time interaction, non-rivalry and network externalities, etc.) and their functionality and behavior is therefore interdependent. An e-business model for example, pioneered for a B2B marketplace, might be adopted by a health sector, or for e-government purposes. On the other hand, the existence of such e-government software programs might influence the behavior of other e-sectors (e-learning, e-culture, etc.). Besides these common influences, the behavior of a specific Vertical Sector is also influenced by the historical and organizational characteristics of the existing sectors. Such path-dependencies need to be taken into consideration.

Finally it becomes obvious that the technological groundwork of the Horizontal Layers of an Information Society, is necessary, but not sufficient, to achieve the digitization of information and communications processes in the Vertical Sectors. The process of digitization requires a complex institutional change, and does not happen automatically by introducing the adequate technology. Attention needs to be paid to different Diagonal Areas, to guide societies in this change and to overcome path dependencies and adapt to local particularities.

In this respect it is necessary to adjust and establish adequate Regulatory Frameworks. These frameworks should ensure the development of the different Horizontal Layers through regulation of the industries involved and should enable the expansion and growth of digital activity in the Vertical Sectors, ensuring that confidential information can be exchanged securely. Furthermore, such a Regulatory Framework for the Information Society implies a special focus on guaranteeing several basic rights (such as freedom of speech, intellectual property rights, linguistic non-discrimination, etc.).

Acquiring and implementing technology requires financial capital. Resources are needed to allow a universal Information Society for all to become a reality. Financing a sustainable Information Society involves the

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[17] The list of Vertical sectors might be continued for a more detailed discussion see introductory paragraphs of the Sections "Vertical Sectors".

participation of the private and public sectors. While the private sector's focus on profit must be respected and addressed, the public sector needs to find mechanisms to assure the inclusion of all its citizens.

Last but not least, to create and exploit the Horizontal Layers adequately, and enable digitization of information flows, communication processes and coordination mechanisms in the different Vertical Sectors, Human Capital is required, for it is the driving force behind the technology.

In summary, in order to tackle the challenging task of "building an Information Society", the strategy needs to be built on Horizontal Layers, which constitute the technological groundwork (Infrastructure and Generic Services); Vertical Sectors, which are subject to the process of digitization (e-business, e-government, e-health, e-culture, e-learning and e-media have been chosen for this book); and finally Diagonal Areas, which support the development of the different Horizontal Layers and Vertical Sectors (Regulatory Frameworks, Financing, Human Capital). Together, they constitute the three-dimensional conceptual framework of this book (see graph in the Overview).

B. Strategies for an information society

It is often claimed that the present "time of great structural change" (U.S. White House, 1997) provides developing countries with a historical opportunity to "catch-up" in the development process. The definition of the concept of "development" should not be restricted to economic growth alone. The digitization of information and communication processes is about broadening people's choices so they are able to participate in the life of a local or global community. They are also about creating an environment in which people can develop their full potential and live creative lives according to their needs and interests (UNDP, 2001). However, simultaneously a new form of exclusion is emerging, known as the "Digital Divide". It can widen the gap between regions and countries (international Digital Divide), as well as between groups within societies (domestic Digital Divide). In order to prevent this from happening, the advent of the new technological paradigm should be seen as a "Digital Opportunity". However, in order to take advantage of this opportunity it is essential to establish and implement global, regional, national and local development strategies. Such strategies have to be implemented in all of the Diagonal Areas (Regulatory Framework, Financing, Human Capital), as well as in the individual Horizontal Layers (Infrastructure and Generic Services) and Vertical Sectors (e-Sectors).

This Section gives a brief outlook on the nature and trajectory of a technology-based paradigm such as ICTs. It raises the question of whether and how the evolutionary path of this new paradigm will effectively open a window of opportunities, and if so, what can developing countries do to take advantage of those opportunities.

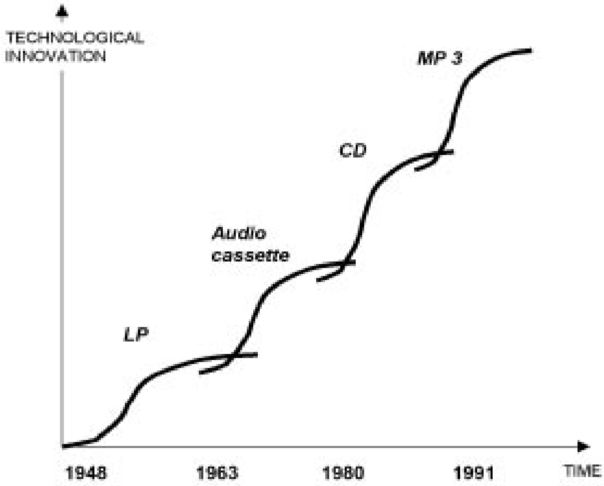
1. Technical change and the window of opportunity

A long line of economic thinkers including Smith, Ricardo, Marx and later Schumpeter have traditionally seen the capitalist economic development model as based on a continual reconfiguration of production and distribution processes. "The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization" (Schumpeter, 1934). The adjective "new" refers to the constant knowledge evolution, which has been discussed in the introductory Section (see Box "The Knowledge Process"). The process —which Schumpeter coined as "creative destruction"— is a clear "discontinuity" in the evolution of the knowledge component. The codification of the new knowledge and its transformation into equipment constitute new technological solutions. The logic of the system is that every innovation improves performance. The life cycles of these innovations can be of a rather short nature (such as in audio recording for example: LP => audio cassette => CD => MP3). But the powers of "creative destruction" are not only restricted to a certain product. The entire industrial organization, markets and institutions are "incessantly revolutionized from within" (Schumpeter, 1934). Such "revolutions" can last for decades (so-called "long waves" or "Kondratieffs") (see graph).

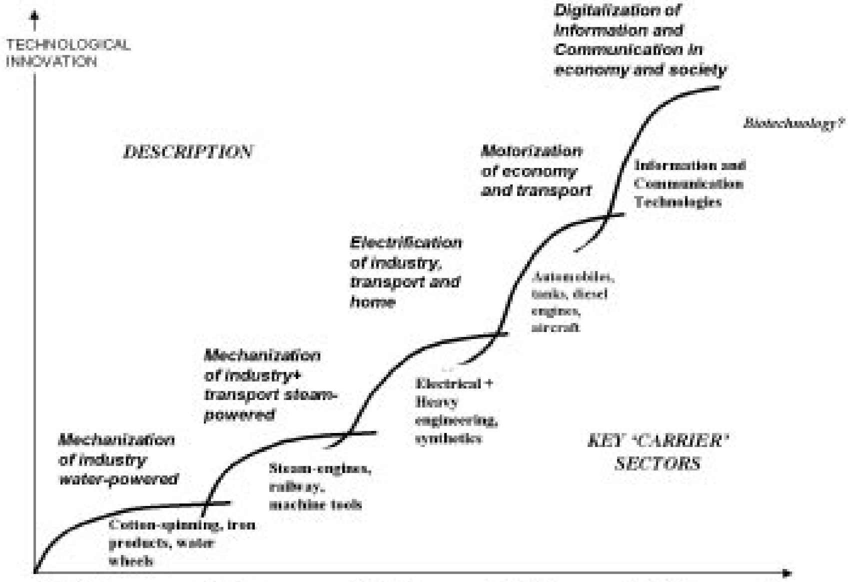
Organizational structures are constantly evolving and aim at improving performance. Undeniably, social and economic transformations occur during these "long waves" of technological development, shifting from one "techno-economic paradigm" to another (Freeman and Perez, 1988). The widespread use of Information and Communication Technologies and the consequent process of digitization are the latest wave (but surely not the last) in a succession of pervasive innovations, which have shaped development over the centuries.

CREATIVE DESTRUCTION IN SHORT CYCLES AND LONG WAVES

Short cycles: The creative destruction in audio recording



Long waves: technology-based paradigms



Source: Martin R.Hilbert based on Atomic Rom, «Great Moments in Multimedia History», Atomic Rom Productions, (http://home.earthlink.net/atomic_rom/moments.htm), 1996; Christopher Freeman and others, *As Time Goes By: From the Industrial Revolutions to the Information Revolution,* Oxford, Oxford University Press, 2001.

While the existence of "long-waves" is widely recognized in scientific theory, it is questionable whether they are important enough to allow different countries to draw up policies based on this phenomena and therefore see some tangible social and economic development. Entering and catching up always strongly depends on the peculiar window of opportunity created by successive technological revolutions (Pérez, 2001).

For developing countries, it is important to consider both, the stage of development of a given technological system, and whether that system is continuously building upon itself or has reached a point of discontinuity (Dosi, et al 1988). The second point is of major importance. According to the logic of the dynamics, if technological systems are continuously building upon each other, the previous leader should retain its leadership in the new system. However, on the contrary, all development policies have in one way or another been geared toward breaking away from this vicious circle (Pérez and Soete, 1988).

Undoubtedly vicious circles are a fact of life in the development process. Existing capital is needed to generate new capital, already-acquired knowledge is needed to create new knowledge and skills are needed to acquire new skills. This leads to the conclusion that a certain level of technology infrastructure favors the employment of new technological systems, etc. However, in practice there are often discontinuities, co-developments of similar alternatives or mergers of formally separate markets, which add complexity to the equation and create opportunities for new players. Network externalities, economies of scale and scope, formal or informal standard setting add to the process and all of these discontinuities become potential entry points for latecomers, giving them the opportunity to "leapfrog" over previous obsolete technological advances and incorporate the latest technological solutions.

2. Leapfrogging and catch-up

Important elements of a leapfrogging strategy are the different diffusion-curves, the various associated learning-curves and the previously acquired skills and equipment that can form part of the ongoing technological evolution.

Technical innovation cycles are extremely short in the Infrastructure and Generic Services Layers of ICT systems. The often-cited "law of Moore" (which states the power of a micro chip doubles every 18 months) and ever increasing Internet bandwidth (in 2001 more data could be sent over a single cable in one second than in 1997 was sent over the entire Internet in a month (Gilder, 2000), illustrate the speed of innovation in the Infrastructure Layer.

The fast pace of creative destruction in the ICT sector constantly hinders real technological evolution and opens up plenty of 'potential entry points' for leapfrogging technological solutions.

Leapfrogging gives countries the hope of "catching-up" not only technologically by implementing advanced ICTs, but also by reorganizing institutions and market mechanisms. Therefore the opportunities are twofold:

- Leapfrogging technological solutions ("technological leapfrogging" in the Horizontal Layers)
- And leapfrogging in social and productive organization ("institutional leapfrogging" in the Vertical "e-Sectors")

Societies can catch-up or speed up development of technological systems in the Horizontal Layers. In fact, this is a natural process. In 2001, e-mailing a 40-page document from Chile to Kenya cost less than 10 cents, faxing it about US$ 10, and sending it by courier US$ 50 (UNDP, 2001). New technological solutions improve performance (in this case regarding speed), while lowering costs. The penetration of fax machines in countries like Chile will never reach the same level as highly developed countries. But countries like Chile can avoid incorporating outdated and expensive technology, by leapfrogging over that stage and directly implementing advanced solutions.

The smaller the gap in technology between the more advanced and the less advanced systems gets, the more precise and sophisticated the leapfrogging strategies are needed for those trying to catch-up. This requires close observation of current and future technological developments and visionary planning. A good example of the success of leapfrogging is South Korea's Infrastructure Layer. While in 1998 Internet infrastructure in the United States was far more advanced than in South Korea, in 2001 the Asian country surpassed the United States in relative terms —both quantitatively and qualitatively— in Internet access. According to the ITU, in 2001 South Korea's Internet penetration was 16 percent higher than that of the United States (ITU, 2002). Furthermore, up to 90 percent of users in the United States still accessed the Internet through a dial-up connection in 2001, while only 2 percent used a broadband DSL connection. In South Korea, in the same period, 52 percent used DSL broadband and only 28 percent still used a traditional narrow-band dial-up modem (eMarketer, 2001).

Another example of creative destruction in the Infrastructure Layer is the transition from cable to wireless systems. Developing countries with large parts of the population living in rural areas (e.g. in Bolivia 46 percent live in rural areas; in Guatemala 61 percent) will never reach the same penetration levels of fixed telecommunication copper cables, as the United States or European countries have. However, they may not necessarily need to. Installing different wireless communication networks (fixed wireless, satellite and mobile) is a potential alternative to cover vast rural areas rapidly and to narrow the tremendous technological gap with developed countries.

By "leapfrogging" the stage of fax machines, dial-up Internet access, or obsolete copper telecommunication systems, countries can optimize scarce capital resources and the learning process can start at a more advanced stage. In Africa for example, people are accessing the Internet, before having made their first telephone call (OECD/UN/UNDP/World Bank, 2001). Of course, in a country with a longer technological tradition, the learning process might be accelerated, since previous experience and spillover effects from using two previous consecutive generations of technological solutions speeds up the learning process. Hence, knowing how to send a fax helps the user to learn how to send an e-mail. However, many previous fax-users are proving reluctant to adapt to e-mail thus causing the above-mentioned discontinuity in technological development and therefore creating a window of opportunity for technologically under developed countries to catch-up. The habitual use of a fax, covers the users necessity and there is no need to transit to e-mailing. On the other hand, for a less developed country it would not make sense to first pass through previous technological stages(in this case fax), to help it learn how to use the next stage (e-mail).

It is worthwhile pointing out that leapfrogging into an advanced technological system is a rather complex process and requires special attention to various Diagonal Areas (such as the regulatory frameworks, human capital and financing) (see also example of 3G mobile telephony in the Box). Continuing with the example of fax and e-mail, the 'regulatory framework' in which the technology is set needs to assure users that electronic mail is as reliable, authentic and legally valid as the fax message (e.g. through digital signatures or electronic certification legislation). User capacitating is another basic requirement, calling for special policies in the 'human capital' area. Also 'financing' mechanisms need to be adjusted. In the transition to e-business, experience shows that a minimum of Venture Capital is necessary. An adequate adjustment of the Diagonal Areas becomes key for success or failure of a leapfrogging strategy.

LEAPFROGGING INTO 3G MOBILE TELEPHONY?

A concrete example of creative destruction in ICT is mobile telephony. This technological system constantly evolves through different generations, from 1G (first generation analogue), to 2G (second generation), through 2.5G, to third generation mobile telephony (3G). The case of Venezuela is very interesting, as, contrary to most Latin American countries, Venezuela has the required radio-spectrum frequency to implement 3G (UMTS) services unoccupied, and therefore would be technically able to license and introduce UMTS right away. As there are only 2G systems functioning in the country in 2002, operators could leapfrog the 2.5G stage. Mobile telephony in Venezuela has experienced explosive growth in recent years; however, "e-wareness" and the digital culture of the Internet only partially exist in Venezuela. The two to three percent penetration rate of the Internet in 2001 shows that digital practices have not been received with the same euphoria as in other countries. An e-commerce sector only semi exist.

Would it be feasible to leapfrog 2.5G? Building up confidence and helping learning processes on the supply as well as on the demand side of digital practices is becoming the focus point of discussion. The supply of digital content is very weak and under developed in Venezuela. By gradually developing 2G networks and progressing to 2.5G and 3G, content suppliers could gradually learn about the mobile business. Content providers would be given time to learn and the industry could grow and mature gradually. On the demand side, consumers would progressively discover and adapt to new services.

Based on this theory it would seem more logical to start building up confidence, familiarity and knowledge of digital service provision by slowly introducing 2.5G services and frequently upgrading them. This would imply postponing 3G-frequency licensing. However by "leapfrogging" 2.5G and passing directly on to 3G Venezuelan consumers would have the opportunity to be among the first in the world to benefit from 3G services. The Venezuelan content producers could move into the vanguard of Spanish language content development on the mobile Internet platform, which is expected to open up a whole new industry. On the other hand, it is not certain how many Venezuelan consumers would financially be able to leapfrog into 3G, as the new technology is expected to be very expensive at the beginning. Additionally, the low level of know-how in the Venezuelan content industry (there is only a quasi Internet market) might be a major obstacle for providing adequate content to feed 3G networks. This case illustrates very clearly, that the risk of leapfrogging in comparison with gradual evolution is very high. There is a fine line between a potential catch-up and failure, frustration and an even further setback.

Source: Martin R. Hilbert and Ben Petrazzini, «3G Mobile Policy: The Cases of Chile and Venezuela», International Telecommunications Union (ITU) (http://www.itu.int/osg/spu/ni/3G/casestudies/chile-venezuela/Chile-Venezuela.PDF), 2001.

These previous considerations have led many to question how leapfrogging strategies may be applied to institutional and organizational learning curves. As already discussed in the previous Section, institutions and organizational structures (formal rules, informal norms of behavior, customs and codes of conduct, common ways of interpreting behavior and accepted mechanisms, etc) are subject to a learning process. Immature institutions, inefficient organization and "inefficient ways of doing (organizing) things" are a great obstacle to development. The process of digitization in the different Vertical Sectors of an information Society requires institutional re-organization. By digitizing information flows, communication processes and coordination mechanisms in the Vertical e-Sectors, performance and efficiency can be improved. The question arises that if besides the above-mentioned "technological-leapfrogging" in the Infrastructure and Generic Service Layers, a sophisticated leapfrogging strategy would also allow an "institutional-leapfrogging" through the process of digitization in the Vertical e-Sectors?

The entire world needs to be institutionally reorganized, due to the new basic conditions the Information Society paradigm sets down in the Vertical Sectors. There are claims that the greater juridical, cultural and political flexibility in many developing countries is making it easier for them to adapt to the new paradigm, than traditional industrialized countries (such as in Europe or Japan) which have a strict and detailed regulatory framework and comparatively rigid organizational structures. In some cases the existence of well functioning institutions, in developed countries for example, can cause more reluctance than willingness to change. Given extensive experience with older solutions, new ideas are not always initially perceived as an important improvement. When innovations appear, leaders may have no incentive to adopt the new mechanisms. On the other hand a lack of these institutions and an urgent need for solutions in developing countries is conducive to change. Technologically under developed countries have less experience with old systems and should therefore be more ready to adopt new ones. New technological solutions can offer them an opportunity to tackle long-standing problems and secondly, to bypass developed countries in technological performance[18] (Brezis, Krugman, Tsiddon, 1991), once the new system is operational.

For example, in a region where the traditional postal service is neither reliable nor dependable enough to carry out basic necessities, the potential for online practices is vast. Developing countries should be able to "leapfrog" certain evolutionary stages of postal services that developed countries went through. Since there are many advanced digital forms of postal communication, the digitization of the postal service sector in developing countries could narrow the performance divide between themselves and more advanced countries. Evidence that this is already happening is can be seen in Brazil where 90 percent of income tax declarations were received via the Internet in 2000 (ebusinessforum, 2001). On the other hand the United States —with its reliable traditional postal

[18] Brezis E., Paul Krugman and D. Tsiddon (1991) use this argument in their paper "Leapfrogging: A Theory of Cycles in National Technological Leadership" in order to explain the catch up and the concluding industrial leadership of the U.S. over Great Britain.

service and well organized traditional tax payment mechanisms— is not expected to reach that threshold until 2007 (Forrester, 2000). Other evidence suggests that highly efficient e-finance mechanisms can be introduced quickly, even where basic financial infrastructure is weak (World Bank, 2001). Electronic cash and smart cards offer savings and payment services at a low cost to customers who often do not even have formal bank accounts. Some developing countries are starting to reap significant benefits by making ICTs an essential part of educational reforms (see Section "e-Learning"), while the rigid educational systems in Europe, for example, often hinder the integration of ICTs into the curriculum. Furthermore, ICTs are accredited for enabling institutional leapfrogging in the health sector regarding healthcare service performance (see Section IV "e-Health").

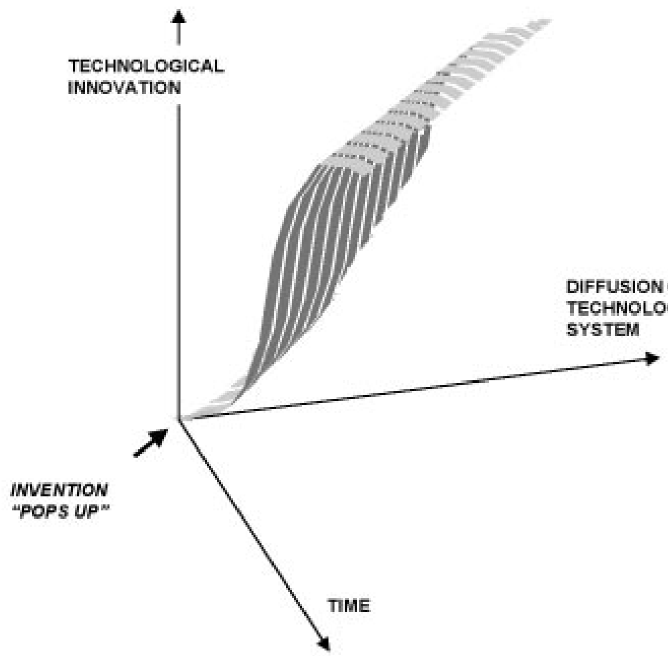
In times of normal, incremental technological change, increasing returns to scale tend to accentuate leadership of developed countries. Developed countries maintain their leadership because of the profits they make on their technology and knowledge. However, at times when there are new innovations or major structural change in institutions worldwide, a temporary window of opportunity opens up for less developed countries (Pérez, 2001). Leapfrogging strategies have to aim to pass on to more advanced stages of industrial and social organization rather than catch up with the existing ones in the developed world. The far-reaching structural changes that the ICT paradigm introduces seem to establish the most favorable conditions for implementing such leapfrogging strategies. During the present phase of paradigm shift, these strategies are being put into practice mostly in the process of digitization of the Vertical e-Sectors.

3. Technology-based divides

Until now, the discussion has referred to a two-dimensional concept (see Graph "Creative destruction in short cycles and long waves"). Technological innovation and the maturity of a technical system has been discussed as if this automatically implies the diffusion and the usage of the system. In other words, the analysis neglected the crucial question about what percentage of the population actually participates and benefits from technological progress. Returning to the graph about "audio recording" above, it is clear that while in the year 2002, MP3 audio recording systems might have represented the technological frontier, many people still use traditional Audio Cassettes and LP records. Especially in a region with such large socioeconomic inequalities as in Latin America and the Caribbean, a small group of society (normally the high-income segment) might be able to "leapfrog" to the technological frontier, while the large majority of the population lacks the resources to do so. This introduces a third dimension into the present analysis: the trajectories of technological diffusion.

Technological systems, as well as all kinds of innovations, have the habit of growing like "mushrooms" and not like "yeast". This analogy is borrowed form Harberger's "Vision of a Growth Process" (1998). Harberger proposes a dichotomy of "yeast vs. mushroom" to explain the growth process. While yeast causes bread to rise evenly, like a balloon being filled with air, mushrooms have the habit of popping up unpredictably almost overnight. Each radical invention represents such discontinuity. After a mushroom has 'popped up', its further development is determined by continuos innovation. At some point the technological system matures and might gain technological supremacy over previous technical solutions. However, at this point only a small group of society might have access to the new technological system. As technological innovation progresses, a diffusion process of that technology begins (see Figure). The axis of "diffusion of the technological system" in the graph demonstrates which percentage of society already has access to the leading technological system. In general, the 'diffusion process' follows the trajectory of the 'innovation and maturity process' with a time lapse. Given the "slow and irregular" nature of the diffusion process (Prebisch, 1951), a divide is created between those who already make use of the new innovation, and those who are still excluded.

THE PROCESS OF CREATIVE DESTRUCTION AND TECHNOLOGY DIFFUSION OVER TIME



Source: Martin R. Hilbert

The process of technological innovation continues until further investment in the knowledge component of the innovation stagnates as it becomes less and less profitable (innovation curve flattens). At this phase the system might eventually be replaced by another product, which improves performance. The price of the original product continues to fall and this accelerates the diffusion curve even further (diffusion axis). However, after a while the diffusion curve will also start to slow down, given that those users naturally migrate to the new product. This natural migration to the technical advanced solution brings the diffusion curve of the outdated product to an eventual halt.

Unfortunately, technical innovations do not seem to follow the "yeast-trajectory" of growth, but rather have the habit of popping up like "mushrooms". Therefore, the diffusion of technological systems starts from a specific area, often restricted to a narrow subdivision of the population, and then slowly penetrates the rest of the society. Given that it is a logical part of the system that advanced solutions improve performance, this helps the "haves" to improve their socio-economic position, while the "have nots" (be it regions, countries, or groups of people) fall behind. This creates inequality in development stages between the segment of society that participates in the wave of progress and the part that is excluded.

In the present technology-based paradigm shift, this phenomenon is known as the "Digital Divide". It is a divide between the ones that can already benefit from ICT, and the ones that cannot access the new technological system. A divide between people who already communicate information and coordinate their behavior through digital networks, and people who have not yet reached this advanced stage of development. It is sometimes also described as the divide between "information rich" and "information poor", where the "information rich" might be able to gain socioeconomic benefit from the information obtained.

A worrying characteristic of this divide is that it is not only creating "information rich" and "information poor", but the "ICT-mushroom" sprouts inside a socioeconomic segment that is characterized by high income and high educational standards. ICT diffusion curves follow the trajectory of existing income distribution and educational standards (see Section "The Digital Divide" in the Infrastructure Section). The empowerment of ICTs leads to a scenario where the existing socioeconomic gaps increase even further, creating development trajectories where the "rich get richer" and the "poor get poorer" (not limiting this richness exclusively to economic wealth).

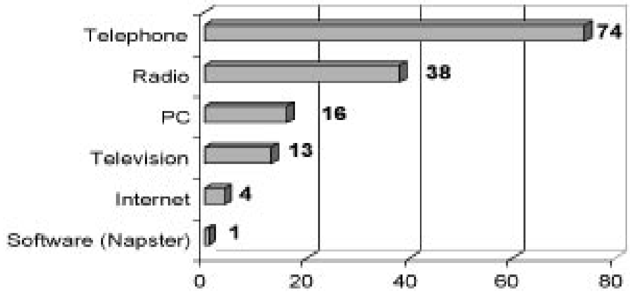
This is a reminder of the process, described by the Nobel laureate Simon Kuznets (1955). The so-called Kuznets curve describes an inverted

U-shaped relationship between inequality and growth: in a time of structural change, inequality first increases and later decreases in the process of development. Kuznets observed this process while analyzing the transition of an economy from a rural/agricultural setting to an urban/ industrial one. This example suggests that a similar process could emerge, decades later, during the structural change in the transition from an industrial age setting to a digital organizational model. The concept of the Digital Divide is visualizing this process. Following the logic of the Kuznets curve, it could be hypothesized that inequality will first increase and later (once more and more people participate and profit from ICT) decrease.

While it can be claimed that other important technological innovations besides ICTs have similar effects, such a powerful and all-encompassing innovation as ICTs should be given special attention. ICTs can help progress toward a broad variety of development goals. ICTs can improve economic efficiency, health services, public administration and educational mechanisms amongst other things. It is clear from the maturing "Information Society paradigm" that the question is not about whether "to get connected" to ICT or "not to get connected", but rather "when to get connected" and "how to get connected".

Compared to other technological systems, the Internet and its digital software applications are invading the globe at an impressive speed (see Figure). However, with present development trajectories this may still take too long. Three years after Internet usage took off in Latin America and Caribbean in 1998, six percent of the population had access to the Internet (Hilbert, 2001a). Considering that this initial six percent is the high-income segment of the population, connecting the remaining 94 percent (including 30 percent that live in poverty) might take several decades. So it is essential to develop strategies aimed at passing through the Kuznets curve as quickly as possible.

YEARS IT TOOK TO REACH 50 MILLION USERS



Source: ITU (International Telecommunication union), *Challenges to the Network 1999: Internet for Development, Updated for TELECOM 99*, Geneva, 1999b.

By passing through the diffusion curve as quickly as possible the "domestic Digital Divide" should narrow. To narrow the "international Digital Divide", Information Society strategies have to evaluate the feasibility of introducing a technological system that is as close as possible to the 'global technological frontier of ICT-connectivity' (mainly defined in terms of quality: broadband, mobile, etc). The more cutting edge this system is, the sooner the Digital Divide will narrow between societies that are already have quality access to the Information Society and those that are less well connected. The ideal would be to achieve both objectives at the same time. In reality, there might be a natural trade-off between both objectives. Generally speaking, the more advanced a technological system is, the slower its diffusion, and the other way around (mechanisms that mainly relate to prices and unequal income distribution). However, since both dimensions of the Digital Divide (domestic and international) need to be addressed, constant evaluation and analysis has to ensure that countries select the most appropriate strategy to suit their individual needs.

4. Entering the present window of opportunity

Many countries around the world pursue special national strategies that aim to integrate them into the global Information Society. Also on an international level the element "Information Society development strategies" (sometimes also "e-Strategies") have become a central part of the development agenda.[19] Information Society development strategies might start with a small governmental initiative, but need to aim to integrate all the public sector, national, regional and international institutions, regulatory and technical authorities, the private sector, mediation institutions and civil society. A holistic approach, with an open dialogue within the entire society, as well as between different societies is indispensable to master the complex task of "building an Information Society".

In order to reach this goal, one of the first steps the public sector has to take is to establish a national authority which acts as a coordinating agency. In Latin America and the Caribbean some countries have already established a national Information Society initiative, while others are still in the process of determining their best approach to such a program. In some existing cases,

[19] Such as in the G-8's Dotforce (www.dotforce.org), the UN ICT Task Force (www.unicttaskforce.org), the World Summit on the Information Society (WSIS 2003-2005 www.wsis.org), the European Union http://europa.eu.int/information_society/eeurope, UNDP, World Bank, UNESCO, the international business community and the international civil society.

countries allocated this task either to the telecommunications authority (e.g. Ministry) or to a Ministry of Science and Technology (such as the "Programa Sociedade da Informação" in Brazil) or to the Ministry of Communications (such as the program "e-Mexico" or the "Agenda de Conectividad" in Colombia). Other countries created an inter-ministerial committee (such as in Chile). Given the far-reaching impact and the generic nature of ICTs, an authority directly linked to the presidency (such as in Paraguay or Uruguay) seems to be a valid alternative. Another approach (for example implemented in the Bahamas) links the national Information Society authority to the Finance Ministry, given the inter-ministerial nature of this important Ministry.

It is paramount that the role of this national Information Society initiative is well defined, in order to prevent overlapping responsibilities. Harmonic cooperation or power-struggles between different authorities involved in the national Information Society Program can be decisive in the success or failure of the strategy.

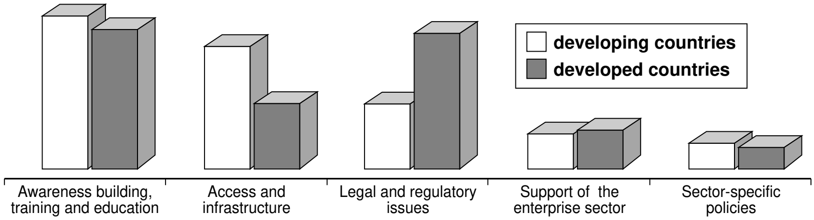
Regardless of where the national Information Society initiative is allocated in the public sector, close collaboration with some of the existing public sector agencies is critical. The national telecommunications regulator plays an important role in assuring the build out of the ICT infrastructure. This gives the telecom industry and its regulating agency a major task in the creation of an Information Society. National apprenticeship agencies (which exist in many countries in the region) have a special role in training the workforce to prepare for the Information Society. Also public health and educational authorities need to be integrated into the ICT public sector program.

However, as the conceptual framework of this book suggests, the Information Society goes far beyond the public sector. Other actors in the Infrastructure Layer that need to be incorporated into the national initiative are the hardware industry, or Internet governance organizations (such as domain name registers). A multitude of other actors can also be identified in the Generic Services Layer. Every generic or specialized digital application that allows the creation of value out of the technological infrastructure falls into this Layer, such as the software industry, with all of its standardization bodies, Webdesigner, the ASP industry, amongst others.

Various actors can also be identified for the different Vertical Sectors. Working with the "cube" as the conceptual framework of this book allows the identification of different intersections between the strategies in the Diagonal Areas and the various Vertical Sectors. In the intersection with the "e-Business" sector, Chambers of Commerce and other initiatives that support small-and medium-sized Enterprises for example, the same as B2B marketplaces (which become the dominant and critical nodes of the Digital Economy), need to be involved. In the Vertical Sector "e-Government", municipalities and ministries and all other administrative bodies of the public sector (especially the tax authority, which is in many cases the State's largest information processor) need to be integrated into the Information Society Strategy. Depending on the specific Vertical Sector identified in the "cube", the same could be done for the health sector and its distinct actors, the education sector, the media and broadcasting sector, etc.

In the first quarter of 2002, UNCTAD surveyed 51 countries (37 developing countries and 14 developed countries)[20] about their national Information Society strategies (UNCTAD, 2002). Both developed and developing countries were found to prioritize "Awareness building, training and education" elements in their national Strategies. Besides this common focus, developed countries put more emphasis on "Legal and regulatory issues", while developing countries prioritize "Access and Infrastructure" issues in their strategic planning (see graph).

DEVELOPING AND DEVELOPED COUNTRIES SET SLIGHTLY DIFFERENT FOCUSES IN THEIR NATIONAL INFORMATION SOCIETY STRATEGIES



Source: UNCTAD Internet survey of national e-Strategies

Most of the existing Information Society strategies in Latin America and the Caribbean have a special focus on fighting the domestic digital divide. Given the harsh socioeconomic differences in Latin America and the Caribbean and the prevailing geographic concentration, the Digital Divide within Latin American and Caribbean societies is one of the largest in the world (see Section "The Digital Divide" in the Infrastructure Section). By paying close attention to regulation of telecommunications pricing, in order to narrow regional differences or by establishing public access points ("Infocentros"), governments aim to reduce the gap. Furthermore, some

20 Nine countries from Latin America and the Caribbean had been included: Brazil, Costa Rica, Cuba, Guatemala, Jamaica, Mexico, Peru, Trinidad and Tobago, Uruguay.

countries prioritize the training of Human Capital (such as in Costa Rica), while in other countries the link between the national 'training authority' and the national Information Society authority is still very weak, or does not even exist (see Section "Human Capital"). Special focus is also put on "e-Government". Online tax paying and B2G practices are pioneers in this sector (especially in Brazil, Chile and Mexico). Also "e-Learning" (including ICT in schools and Internet2) and the general use of ICT for education mechanisms is a further pillar of most of Information Society strategies in the region. Given the structural importance of small and medium sized enterprises (SMEs) in Latin American and Caribbean economies (more in terms of employment opportunities, than in terms of contribution to GDP), projects which support the integration of ICTs in SMEs are often included in national Information Society strategies as well. One positive development is the increasing focus on less traditional e-sectors (such as e-health) which leads to a broader concept of "ICT-for-development". There is tremendous potential for digitizing the health sector , but as underlined in the later Section about "e-health", this sector has still not yet adequately embraced the new possibilities in the region.

A central question to solve is how to make the participation of the private sector and the civil society an institutional part of the national Information Society strategy. As it becomes clear that the hierarchical structure of the public sector does not have the flexibility and efficiency required to keep up with the dynamics of market mechanisms, the public sector should try to integrate the private sector more into its decision making. This should be done in a non-discriminatory and neutral way right from the start. Chile's "*Alianza Público-Privado para el Internet*", which is based on four concepts "transparency, efficiency, technological neutrality and private leadership" is a shining example of good practices in public-private partnership.[21] (Hilbert and Petrazzini, 2001).

Establishing and maintaining a national Information Society initative does not necessarily require a lot of resources. In many respects, it is merely a task of creating synergies, linkages, co-operation and co-ordination among the many stakeholders in a national Information Society and to discuss and set the right policy guidelines. In many cases important steps towards the creation of a national Information Society can be taken mainly by coordinating all those with a vested interest in this development stage on a national scale.[22]

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21 For further details see: http://www.subtel.cl.

22 Belgium for example, has introduced an e-security platform to promptly alert its population in case of potentially harmful computer viruses, through a coordination program. The concept of the platform, which enables nation-wide response within a timeframe of 2 hrs, was established voluntarily, but is highly cost-effective.

In summary, the old saying "Natura non facit saltum" (Darwin, 1859) still rings true today for the transition toward the Information Society. Without planning, following through and regulating far-reaching and radical Information Society development strategies, instead of "catching-up", developing countries will fall further behind. Leapfrogging strategies toward the Information Society have to aim at creating short-cuts in the evolutionary path of technological systems ("technological leapfrogging"), and should be geared toward speeding up the development path towards more advanced social and productive organization ("institutional leapfrogging").

Chapter II

Horizontal layers in Latin America and the Caribbean

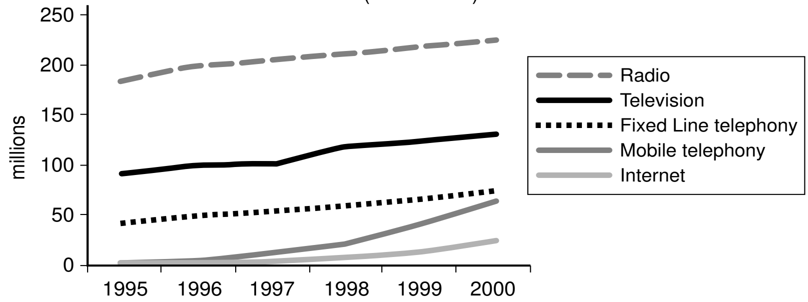
A. Infrastructure

The “Infrastructure Layer”, is certainly the most visible and tangible part of an Information Society. It is the physical embodiment of “the Net”. However, data traffic and the governance of the digital infrastructure are also parts of the infrastructure. Most of the research and initiatives into the emerging Information Society focus on this technological dimension. The convergence of Information and Communication Technologies (ICTs) is making this Layer very dynamic (see Section “Towards a Theory on the Information Society”). Up until now, there have been many different kinds of “information infrastructures” in Latin America and the Caribbean, but driven by ICT-convergence, they are all merging into the “network of networks” (the Internet). The broadcasting technology networks with the highest penetration in the region are radio and television. TV penetration in South American homes is around 83%and in Central America it is about 77% (ITU, 2000a). The infrastructure network with the highest degree of digitization is fixed-line telephony. Almost 100%of this network had already been digitized in 2001.[1] The fastest growing ICT network in Latin America

[1] Some countries have placed a remarkable degree of emphasis on the digitization of fixed-line telephony in recent years. Brazil for example had only 36% of its network digitized in 1994, but 93% of the network had been digitized by 2000 (AHCIET, 2002).

is mobile telephony In June 2002,[2] there were 92.5 million digital cell phone subscribers or 18.1% of the regional population. However, Internet and PC penetration is relatively low. Only 8.0% of the regional population were expected to have access to the Internet in 2002[3] and only 0.3% were estimated to have broadband Internet connections (mostly DSL).[4]

INFORMATION AND COMMUNICATION INFRASTRUCTURE IN LATIN AMERICA (1995-2000)



Source: AHCIET (Hispano-American Association of Centers of Telecommunications Research and Enterprises), «Benchmarking 2001», Analisis comparativo del sector de las telecomunicaciones en Iberoamerica, Madrid, Price waterhouse Coopers, April, 2002;
ITU (International Telecommunication Union), World Telecommunication Indicators Database, 2002.
UNESCO (United Nations Educational, Scientific and Cultural Organization), Institute for Statistics, Paris (http://www.uis.unesco.org), 2002.

In view of the above-mentioned statistics on technology infrastructure in Latin America and the Caribbean (such as the high penetration of televisions and cell-phones), the process of convergence is obviously opening up a great opportunity for the region. The arrival of Digital TV, advances in mobile telephony, VoIP (Voice over IP) and alternative innovations like powerline (the use of the electricity network to connect to the Internet) provide ample scope for drawing up policies aimed at narrowing the notorious "Digital Divide" in ICT Infrastructure.

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2 The breakdown for 2G cellular systems is: GSM: 5.3 million; CDMA: 20.3 million; TDMA: 54.6 million. In addition, there are 12.2 million analogue 1G users (3G Americas, 2002). 2G (or second generation technology) is a term, which refers to mobile telecommunication, which allows voice and data transmission through a mobile network. Data transmission is slow and generally between 9.6 Kbit/s and 14.4 Kbit/s. 2G networks are gradually evolving into 2.5G (GRPS, EDGE) and into 3G (UMTS, cdma200, etc.), which has data transmission speeds of between 400 and 2000 Kbit/s.

3 Worldwide, around nine percent of the population was using the Internet in 2002, but the G-7 countries accounted for 60% of that figure.

4 With the notable exception of Argentina, with 1.3%, broadband penetration was 0.7% in Brazil and 0.6% in Mexico. In comparison, broadband Internet penetration in South Korea was 52% in 2001 making it the world's broadband leader, Canada had 20%, the United States 10%, Spain had three percent and France had 2.5% (eMarketer, 2002).

This Section starts by looking at the current situation of the Digital Divide in Latin America and the Caribbean. The Digital Divide clearly originates in the Infrastructure Layer, though the dimensions and implications of this divide go far beyond the technological infrastructure (CV Mistica). The second section in this Section will go into further detail on regional IP infrastructure and Internet traffic, which flows to, from and within the region. Finally the Section analyzes two dynamic network infrastructures which could have great potential in a developing region like Latin America and the Caribbean. Often not enough attention is paid to these two networks: the television network and its progression to digital television and mobile telephony and its evolution into 3G.

1. The digital divide

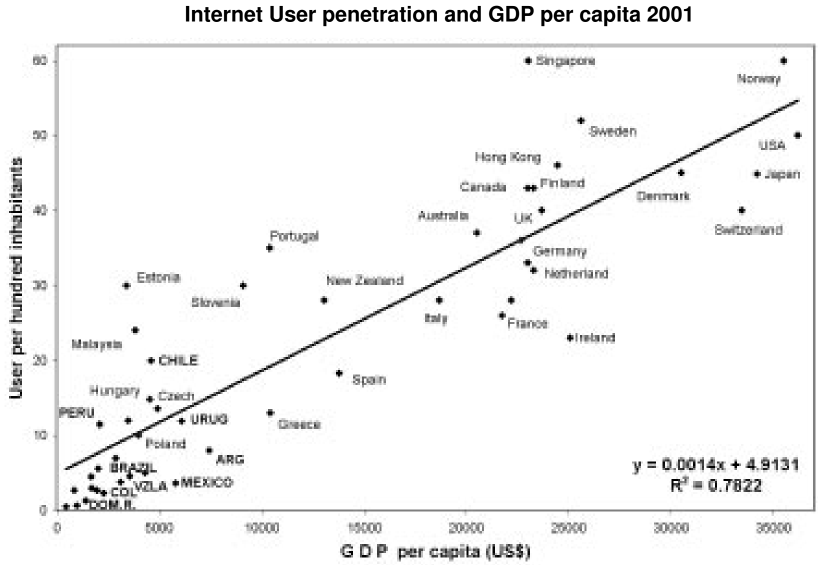
When talking about the Digital Divide, a distinction has to be drawn between two different dimensions. The first is the international Digital Divide. The issues here focus on the spread of technical progress from the originating countries to the rest of the world, about catching-up and about the importance of not falling too far behind. The second (but surely no less important) dimension is the domestic Digital Divide. Discussion of this issue centers on the universal inclusion of all in the information society, about growing with equality, and about avoiding the emergence of yet another form of exclusion. This second focus is of major importance in a region with such harsh social and economic inequalities as those found in Latin American and Caribbean societies.

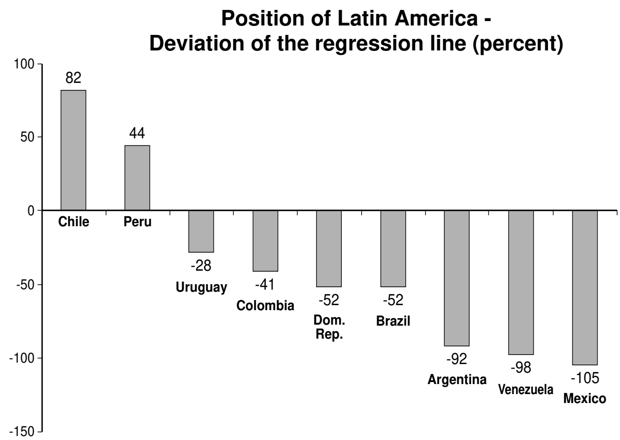
(a) The Digital Divide between Societies

On a world scale of Internet users, Europe and North America account for a bloated percentage of users that is out of proportion to their size. Europe with less than 8.0% of the world's population accounts for 28% of the world's Internet users. The United States and Canada, with 5.0% of the world's population, represent 40%. Latin America, with 8.0% of the world's population is still under-represented with only 4.0% of the world's Internet users (Hilbert, 2001a).

Looking at the level of Internet penetration in a selection of countries around the world, Latin America and the Caribbean is in the last third belonging to the group of countries, which lag behind in Internet connectivity. From the upper one of the two graphs below it appears that there is a clear positive relationship between income levels and Internet usage when comparing the two on an international level. Countries with higher income levels have higher Internet penetration.

INTERNET USER PENETRATION COMPARED WITH INCOME PER CAPITA





Note: Sample of 48 countries from five continents.

Source: Martin R. Hilbert, based on World Telecommunication Indicators Database, 2002.

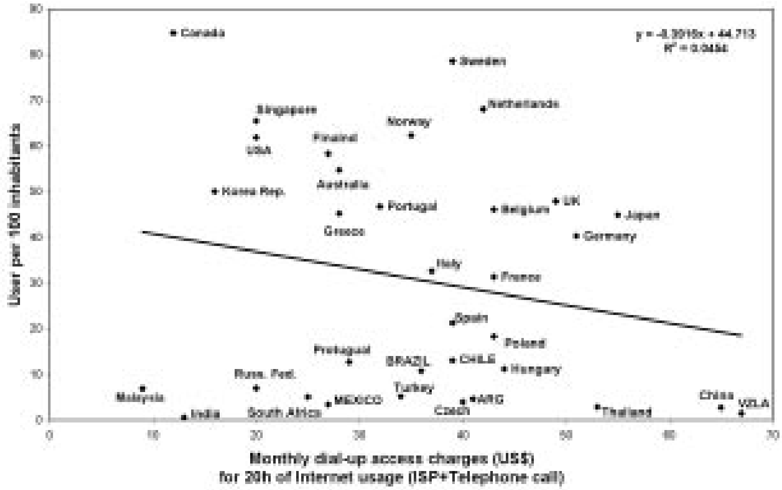
However, a more detailed analysis between per capita Internet penetration and per capita income for 2001, shows that most of the countries in the region are below the statistical norm (which is nothing more than an international 'average' of the relationship between income and connectivity). In other words, Latin American and Caribbean countries could be expected to have higher connectivity rates than they actually do given their income per capita levels.

These figures show that access to ICT Infrastructure is not exclusively determined by income. Other variables besides income seem to account for the fact that some countries (like Chile and Peru) make fuller use of their economic potential (income per capita) than their neighbors. Chile and Peru are both above the international connectivity/income average (82% and 44% respectively). However, the vast majority of Latin American countries fall below that line and do not exploit their economic potential adequately. Venezuela and Mexico seem to exceed in this respect, falling 98% and 105% below the statistical norm, respectively (see lower graph).

There are different reasons for why countries with the same level of income have such varying Internet user rates. The most common argument is variations in internal Internet access costs. ISP charges (Internet Service Provider) and local telephone call rates appear to have great influence on the level of Internet usage in a country. However, when testing this theory, the lower graph shows that ISP and telephone charges cannot be the only determining factor for Internet usage.

NO CLEAR RELATION CAN BE FOUND BETWEEN INTERNET USAGE AND INTERNET ACCESS CHARGES

Internet penetration and Access Charges in 2000



Source: ITU (International Telecommunication union), «ITU Strategy Trends: Reinventing Telecoms» (http://www.itu/osg/spu/trends/jan-marchtrends.html), 2002;
WITSA (World Information Technology and Services Alliance), «ICT at a Glance Tables, WISTA Contribution to the World Bank Development Data Group» (http://www.wista.org/), 2002.

Some countries, like Venezuela, have very high Internet access charges and, as might be expected, very low Internet penetration. However, other countries, such as Mexico, have relatively low Internet access prices, but also low Internet penetration. Countries like Hungary have higher access charges, but surprisingly, also higher penetration rates, etc.

Other factors, besides telecommunication prices influence ICT usage, such as the cost of hardware. While policy in the telecommunications industry often focuses on regulation incentives, competition between the telecom operators, etc, the impact of the hardware industry is often neglected and can be a major contributing factor to the Digital Divide. A complex combination of low competition and monopoly pricing, international price discrimination, market segmentation and other characteristics of the hardware industry (such as inadequate regulation of ICT-convergence) drive up prices in hardware equipment in Latin America and the Caribbean. Comparing the prices of Personal Digital Assistant (PDA) handheld computers in the United States, the European Union, Mexico and Brazil shows that even though the income per capita (GNI) is decisively lower in Latin American countries, hardware equipment is more expensive.

PRICES OF PALM HANDHELD DEVICES; MAY 2002

	Palm M515 (US$)	Palm M130 (US$)	GNI per capita (US$)
United States	399	279	34,100
European Union	478	338	22,000
Mexico	526	367	5,070
Brazil	556	357	3,580

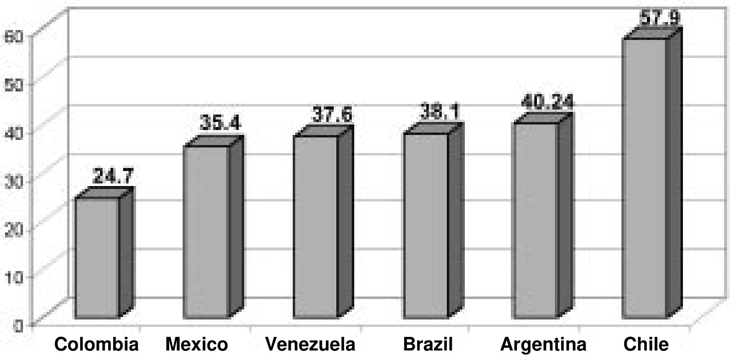
Source: Palm Inc. Estimated Street Prices

Besides differences in income, telecommunications charges and hardware prices, numerous additional factors contribute to the Digital Divide in the Infrastructure Layer. Simple awareness (or lack of it) about the potential of the Digital Opportunity, might be another "soft-factor". In many Latin American and Caribbean countries most people and companies still do not see access to the digital network as a priority.

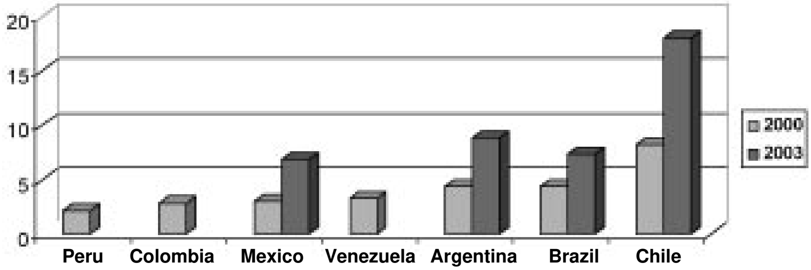
Looking only at the Digital Divide inside the Latin American and Caribbean region, in 1998 less than 1.0% of the populations of all the major countries were connected to the Internet (Hilbert, 2001a). After 1998 Internet usage exploded, making the region the world's fastest growing Internet community (ITU, 2000a). Some of those countries have been faster in connecting their population than others. Chile, for example, represents 8.0% of the regional Internet community, while only 3.0% of the Latin American population (Hilbert, 2001a).

PERCENTAGE OF INHABITANTS CONNECTED IN 2000 (WITH ESTIMATES FOR 2003 –WHERE AVAILABLE)

Total Telephone Subscribers (fixed and mobile)



Internet Subscribers



Source: Martin R. Hilbert, *Latin America on Its Path into the Digital Age: Where Are We?*, Desarrollo productivo series, Nº 104 (LC/L.1555-P), Santiago, Chile. United Nations publication, Sales Nº E.01.II.G.100, 2001a.

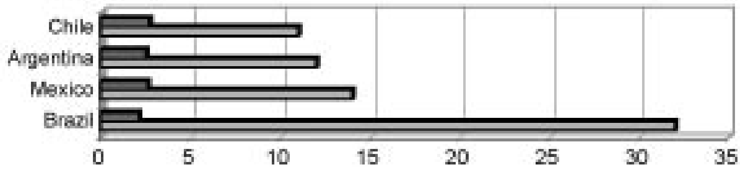
(b) Dimensions of the Digital Divide within the Society

The Digital Divide in the Infrastructure Layer is basically a direct result of an existing "income"— and "educational divide" on a domestic and international level. ICT usage shows a clearly positive relation to both income and educational standards. While both characteristics have independent effects on ICT usage (U.S. Dept. of Commerce, 2001), it is worth remembering that especially in Latin America and the Caribbean, income and education are highly positively correlated themselves.

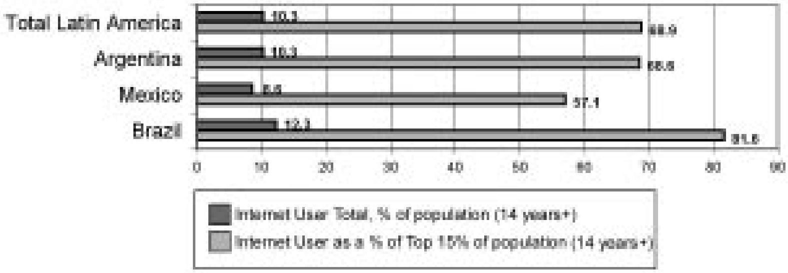
High ICT costs and the resulting unequal income distribution[5] are still the main factors contributing to the Digital Divide in Latin America and the Caribbean. Alarming numbers and estimates about the magnitude of this divide are causing concern that the introducing ICTs is merely widening what is often referred to as the gap between the "information rich" and "information poor". According to eMarketer estimates, almost 20% of the "top 15% of the Latin American population" were connected in 2000, compared to overall connectivity levels of around 3.0%. According to these numbers, this gap is expected to widen significantly. For example, the top income group in Brazil is expected to reach connection rates of 82% in 2004, compared to an estimated overall connectivity of 12%.

THE DANGEROUS LATIN AMERICAN INCOME DIVIDE

Internet penetration in upper and middle class (ligth) vs internet penetration in overall population (dark) 1998/99



The accelerating income divide— estimations for 2004



Source: Martin R. Hilbert, *Latin America on Its Path into the Digital Age: Where Are We?*, Desarrollo productivo series, Nº 104 (LC/L.1555-P), Santiago, Chile. United Nations publication, Sales Nº E.01.II.G.100, 2001a.

Bearing in mind Latin America's gross socioeconomic inequalities, it is clear that those relatively few who are online, not only control a major part of the region's income, but also have the advantage of being able to access the unlimited vastness of information in cyberspace. Worries about increasing inequality in the region seem very justified And an increase in economic inequality might be the first effect to become most evident, given

[5] Roughly speaking the richest 20% receive 50%-60% of the income in Latin America and the Caribbean, while the poorest 60% obtain 20%-30% (ECLAC, 2001b).

the almost pecuniary value of information and the application of information in a knowledge-based economy. But there is a lot more to the Information Society than economic benefits. Access to the Internet can assist in improving overall standards of general education, health, access to public administration and political information, cultural development and all the factors aimed at achieving and maintaining social tranquility inside and between communities. If part of society is excluded from accessing the heart of the Information Society this can create dangerous social and political gaps. The advances of some e-government initiatives in the region are commendable (especially in Brazil, Chile and Mexico). However if the present rate of development continues, the vast majority of citizens in these countries still will be excluded from direct use of this new form of public administration for the next one or two decades. By reviewing actual Internet growth patterns and market saturation rates worldwide (ITU, 2002; eMarketer, 2002)[6] it can roughly be estimated that without special policies from each government it will take until 2020 to reach Internet penetration levels in Latin America and the Caribbean that are similar to those in Sweden, Finland, the United States or Singapore. If this continues, the next generation of Latin American and Caribbean citizens will grow up in a State with two parallel governments in the same society. One of these governments, the e-government, will be transparent, comfortable to use and efficient for the rich people who can access it. Meanwhile the traditional form of public administration, renowned for long queues, paper-based bureaucracy and limited opening hours will continue to be available for the ones who cannot afford to participate in the technological evolution of their government. Such scenarios call for dramatic and far-reaching measures to be taken in order to narrow the Digital Divide inside Latin American and Caribbean societies.

In addition to income, the many other demographic and geographic factors come into the discussion of the Digital Divide. One demographic aspect of the region which could be seen as a positive trait is that it has a young population On average more than half of the population is younger than 25 years of age (51.58%)[7] (ECLAC, 2000a). As is widely recognized, young people adapt a lot easier to modern ICTs than elderly people do (see

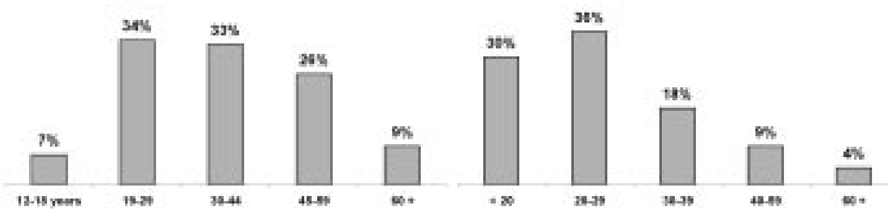
6 See also figures and estimates for Latin American Internet users and Internet user compound annual growth rates from IBOPE eRatings (August 2002); Nielsen/ NetRatings (August 2002); Yankee Group (June 2002); Computer Economics (June, 2002); Morgan Stanley (May 2002); Bank Technology News (March 2002); Probe Research (February 2002); Speer & Associates (December 2001); International Data Corporation IDC (September 2001); Computer Industry Almanac CIA (April 2001); Accenture (February 2001) (cited in eMarketer, 2002).

7 Percentage of population under 25-years old: Chile: 45.12%, Argentina: 45.97%, Brazil: 49.27%, Venezuela: 53.96%, Mexico: 54.12% (ECLAC, 2000a).

Graph), but have less purchasing power. Many analysts believe that the transition toward an information society in Latin America and the Caribbean will naturally accelerate once this young and Internet-savvy generation becomes the driving economic force.

ICT PENETRATION BY AGE GROUP, 2002 (AS % OF EACH AGE GROUP)

Mobile phone usage in Chile — Internet usage in Mexico



Source: Subtel (Subsecretaría de Telecomunicaciones), «Informe Estadístico 4: caracterización socioeconómica de los servicios de telefonía y tecnologías de información y comunicación» (http://www.subtel.cl), january, 2002; eMarketer, *Latin America Online: Demographics, Usage & e-Commerce,* October (http://www.emarketer.com;http://www.emarketer.com/products/report.php?latin_am), 2002.

As is to be expected in the highly urbanized countries of Latin America and the Caribbean,[8] ICT use is geographically concentrated. The continuing trend toward urbanization is reflected —and is often greatly magnified— in the figures that show rate of implementation and usage of modern ICTs. The vast majority of Internet users in Latin American and Caribbean countries are often concentrated in the large capital cities.[9] The geographic divide is often due to the lack of adequate regulation in the telecommunications sector. For example, in 2001 only 27% of the municipalities in Northwest Mexico could access the Internet at the cost of a local telephone call. In the Northeast of Mexico that figure was 23%, in the Mid-East 14%, in Central Mexico 12% (excluding the Federal District and metropolitan areas), while in Southeast Mexico only about 4.0% of the municipalities had access to the Internet at local telephone call rates. For the rest of the population, connecting to the nearest Internet Service Provider costs the same as a long distance call. Therefore high access costs are often preventing rural areas from reaching the Internet.

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8 Urbanization rates in Latin America and the Caribbean include Mexico: 75%; Brazil: 80.4%; Chile: 85.7%; Venezuela: 87.4%; Argentina: 89.6% (ECLAC, 2000a)

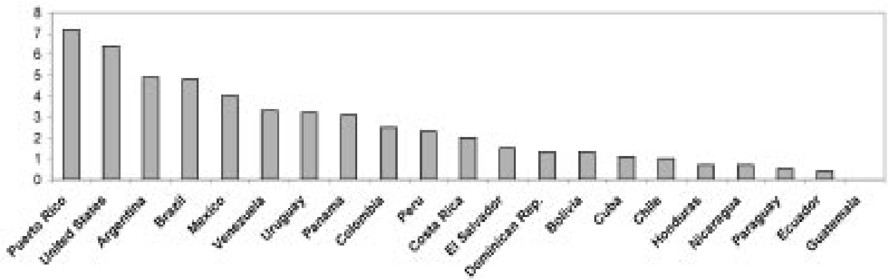
9 Following the same line of argument, it could be claimed that high urbanization favors the diffusion of ICTs. Those nations where higher levels of the population live in rural regions than in urbanized areas-such as El Salvador (55% urbanized), Guatemala (39%), Paraguay (56%), Nicaragua (55%), Bolivia (64%), etc., have far less fixed line and mobile penetration than highly urbanized countries.

(c) Universal Access

"Universal access" has became the buzzword meaning that the end goal is to ensure all of society has access to the ICT Infrastructure Layer. A traditional way of making better use of scarce resources (such as ICT infrastructure) is to share it amongst as many people as possible. Usage time of the infrastructure is maximized while fixed-costs are shared between a large number of users.

The concept of providing "universal access" to telecommunications has long been a goal in Latin America and the Caribbean. The model of shared access to telecommunications was successfully pioneered by fixed-line telephony where public telephones were installed all over the region. The number of public telephones doubled in Latin America from 1.6 per 1,000 inhabitants in 1994 to 3.2 in 1999.

PUBLIC TELEPHONES PER 1,000 INHABITANTS IN 1999



Source: World Telecommunication Indicators Database, 2002.

While this might still seem like very low penetration levels, the model of "shared access" implies that a large percentage of society can benefit from minimum investment. Statistical evidence from Chile demonstrates this. In November 2000, 28.1% of Chilean households had their own fixed line telephone, 24.5% of Chilean homes had access to both fixed line and mobile telephones, while an additional 14.6% of households used exclusively mobile phones. This left 32.2% of Chilean households without any kind of personal telecommunication. The national telecommunications regulator decided to allow four small companies to set up public telephones throughout the country. Since then, more than 15,000 public telephones have been installed in Chile. Although fixed-line penetration of public phones is still relatively low (one per 1,000 inhabitants), the improvement has been impressive, as public telephones provide another 25% of Chilean households with access to telecommunications within 8 blocks of their homes (Subtel, 2002).

Having learnt from the positive experience with fixed-line telephony, many telecom regulators in Latin America decided to apply this concept to Internet access. In Latin America, only 14 million of the 33 million Internet users in 2002 had access to the Internet in their homes. The rest of the users had to access the Web at their workplace, in schools or at public access points. The so-called "info-centros", public Internet access points, are sprouting up throughout the region. Usually, national telecommunications authorities provide special funds to finance these public access points. Many of these funds were originally created to link up rural or unprofitable areas to basic telephony. The funds are financed by filtering off a certain percentage of income from telecom operators (usually operators are obliged to contribute 1.0% of their gross income to the fund) or from other incomes collected by the regulatory authorities (e.g. licensing fees, etc.). By November 2001 for example, the Brazilian regulatory authority had collected more than US$ 400 million through its telecommunications fund, the vast majority of which went toward subsidizing Internet access and end-user equipment.[10]

RED CIENTIFICA PERUANA (RCP)-PUBLIC INTERNET BOOTHS

Established in 1991 by a consortium of Peruvian universities and other non-governmental organizations, RCP became Peru's first ISP. From the start, it worked to make the Internet accessible to all as well as useful for the country's large low-income market. To achieve its goal of increasing Peru's Internet user base, RCP adopted a strategy of educating the population about the Internet, building the technical capacity to provide mass access to the technology and offering relevant local content. With a conviction that Internet access should be cheaply and widely available to the population from public booths, in much the same way as telephone services, RCP's founder José Soriano, adapted the concept of the Internet café to Peru's *cabinas públicas* or public booths. There, users can access the Internet at prices ranging from US$ 1.50 per hour to US$ 15 per month. RCP also runs free educational centers that teach Peruvians how to use computers and surf the Internet. The combination of low-cost cabinas and free training has proven highly successful, particularly in making the Internet attractive and relevant to the population at large. At the same time, RCP's cooperative, franchise model has helped keep costs down and enabled the company to rapidly expand throughout Peru. All members of the cooperative help shoulder equipment costs and share access to the network, while cabina franchises are available at costs low enough to make them accessible even to entrepreneurs of modest means. The franchises have expanded beyond major urban centers and there are now several hundred, supported or managed directly by RCP, throughout Peru. The RCP model has great potential to be applied in other developing regions around the world.

Source: Noah Elkin, «e-commerce in Latin America» paper presented of the expert meeting «America Latina hacia la era digital», ECLAC, Santiago de Chile, November 2001.

[10] Formerly, universal access was financed through a series of subsidies. However, obtaining these subsidies from different socioeconomic groups, geographical regions, different types of services or a mix of them all proved difficult in many cases. The new funds prove more effective and impressive results have been obtained in a short time.

Despite the success of public Internet access, the demand far exceeds the capacity of available resources. As will be discussed in a later Section (see Section "Financing a universal Information Society for all"), the public sector alone, in its current state, is incapable of reducing the inequality caused by competitive markets. Creative ways of cooperating with the private sector, as well as new incentives need to be found. In some countries the so-called "info-centros" have become a valid business-model. Peru is a unique case in point. Peru's public Internet booths have been spread by the *Red Científica Peruana* (RCP), a non-profit, cooperative organization that began as Peru's first Internet Service Provider (ISP) (see Box).

As a result of the successful public access model in Peru, the number of Internet users per Internet host is now up to 14 times higher in Peru than in any other country in Latin America and the Caribbean. Netsizer, is an Internet statistics company and unit of telecom technology company Telcordia, which measures users and hosts by continuously taking random samples of IP addresses. According to Netsizer there were 2.6 users per Internet host in the U.S. in the first quarter of 2002, 5.7 users per host in Central America and 11.9 users per host in the whole of South America. In Peru, the company says there were 81.1 Internet users per Internet host in the same period which demonstrates the potential of what can be achieved with the shared-access model (Netsizer, 2002).

An increase in the number of people sharing an access account is indicative of a country's economic deterioration and is a trend that is found throughout the developing world. During the downturn in Venezuela's economy over the last two years, for example, the number of Internet users more than doubled between 1999 and 2001 (from 0.5 million to 1.3 million), yet the number of Internet users per Internet host rose from 2.51 in 1999 to 4.93 in 2001 (eMarketer, 2002).

(d) Challenging the Digital Divide

For the Internet to function as a tool for boosting equality, prosperity and democracy, nations must offer equal access to technology products and services to all of their citizens. The Infrastructure Layer consists of a complex combination of various industries, with hardware and telecommunications being the two predominant ones. The structure, the functionality and performance of both markets are key for narrowing the Digital Divide. Additionally, the degree of access to the Infrastructure Layer depends on a wide range of variables including, income per capita, urbanization, shared access models, demographic characteristics, education, adequate content, etc.

A distinction may be drawn between two kinds of policies used to narrow the Digital Divide. The first ones can be termed as "micro-policies". They are projects that aim for fast results. Pilot programs are under way in many countries in the region that provide Internet access at schools, public libraries, community centers, other official buildings (such as post offices) and low-cost "info-centros". However, public sector means of providing universal access at these places might be limited in Latin America and the Caribbean (see Section "Financing a universal Information Society for all"). This calls for a need to find creative ways of exploiting the available resources to the maximum. Chile's telecommunications authority started a project of "computer recycling" in 2002. Companies and individuals give away, through public auctions, out-of-date computers to public Internet access initiatives.[11] Experience in Peru shows that the public access model also has great potential for being a successful business model. The potential of "public access" has not yet been adequately exploited in most countries in the region. While in Peru —the region's best example of the public access model in operation— there are still almost seven times more people sharing one Internet host than in the rest of the region.

Furthermore, in order to successfully reduce the Digital Divide in the Infrastructure Layer, long-term strategies are needed that take into account the progression of ICT convergence. The benefits of these kinds of "macro-policies", such as ICT convergence might be less tangible or apparent in the short term, but are very important in a development technological catch-up strategy. Regrettably they are often neglected in Latin America and the Caribbean. The telecommunications industry heavily depends on medium-to-long-term planning. Investments require 10 to 15 years of amortization so such issues need to be taken into consideration for these long-term technological development strategies to come to fruition (see section about "Technical Standards"). For example, when a government is deciding whether to introduce 3G mobile telephony or digital TV, it needs to consider that it is likely that these two technologies will merge in 10 to 15 years. Therefore when selecting a 3G frequency or a digital TV platform it has to make sure it is not putting expensive obstacles in the way of future ICT-convergence.

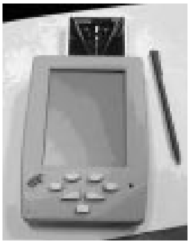
The goal should be to lower access costs and facilitate the learning process. Making efficient use of the existing infrastructure —for example TV (see section about "Digital TV") or mobile telephony (see according section)— supports both of these goals. The majority of Latin Americans

11 http://www.subtel.cl.

have already invested in TV infrastructure and are comfortable with using it. This should make it easier to switch to digital TV. Also, incorporating alternative access solutions, such as powerline (using the electricity network to access the Internet) is a positive choice considering there is a high penetration of electricity networks in Latin America and the Caribbean, especially in urbanized areas.[12] And well-regulated and healthy competition between the different access alternatives should bring down prices.

PROVIDING COMPUTERS TO THE PEOPLE- THE IDEA OF A "VOLKSCOMPUTER"

In late 2000, in response to concerns that Brazil's social and economic inequalities might deepen if the poor were starved of information technology, the Brazilian government commissioned a team of scientists at the Federal University of Minas Gerais in Belo Horizonte, to design a low-budget computer. The project was accomplished and a computer designed through a massive coordination of effort between the government, the computer industry, and academia but, with funding of only US$ 75,000, and without requiring any major technological innovations. The computer had to have a modem, a color monitor, speakers, a mouse and simple Internet-browsing software. It also had to be modular so users could later add a printer or disk drives. The final version of the so-called "Popular PC" costs around US$ 300. It has a 500-megahertz processor, 64 megabytes of main memory and 16 MB more on a flash chip that substitutes for a hard drive. The device can be connected to the Internet using a 56 kbps modem. The software is Linux-based and therefore free. The PC will be primarily used in social programs from the government's telecommunications fund FUST (Fundo de Universalização das Telecomunicações-Fund for the Universalization of Communication). The government intends to buy the first shipment of PC's to equip schools, libraries, health posts and communities, in order to provide easy access to the Internet. Private consumers will be able to purchase the computer in US$ 15 monthly installments.



Another best practice related to the development of a "Volkscomputer" comes from India. The "Simputer" —short for "simple", "inexpensive" and "multilingual"— looks and feels like a bulkier handheld device. It is powered by three AAA batteries and the keyboard is substituted by an interface that comprises mainly icons and graphics on a touch screen. The Simputer uses Linux open-source software and is available for around US$ 200. It can be connected to the Internet through any telephone booth. The device also has text-to-speech capability and translates English-language Web sites into four different local Indian languages, reading the content aloud to illiterate users (www.simputer.org).

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12 The Chilean government announced in December 2001 the launch of a pilot project which will provide 50 clients in Santiago with Power Line Communications (PLC) services and it is now evaluating the possibility of expanding the project (Subtel, http://www.subtel.cl). Also one of Brazil's largest energy concerns began testing broadband powerline technology with 40 homes in Belo Horizonte at the end of December 2001.

It is worth remembering that "access costs" are determined by a combination of telecommunications costs (a variable cost) and the fixed cost of ICT equipment. The cost of access equipment (such as a PC with an Internet browser for example) is often prohibitively high. In 2001, market conditions in Latin America and the Caribbean meant that the cheapest PCs that could be found were around US$ 500 each. However, with an average annual income per capita in the region of less than US$ 4000 (ECLAC, 2001b) and a total annual ICT-expenditure of around US$ 300 per capita[13] (WITSA, 2002), it seems unlikely that universal Internet access will be achieved by individuals buying computers. Not at the current prices anyway. Given these hard facts, the Brazilian government started an initiative in 2000, which aimed to develop a "computer for the people" (see Box above).

Furthermore, in the process of ICT-convergence Internet access is not limited to a PC.[14] The are other devices that can access the Internet, such as, Digital Television, so-called set-top-boxes (which upgrade analogue television sets) and high-speed Internet mobile devices. The success of these devices will not be determined by the type of service they provide, but by their different characteristics, such as whether they are "portable", "fixed", "personal" or "shared", and whether they have high or low "resolution", "audio quality" or "memory". Equipment will need to be adjusted to the individual's minimum requirements in sophistication and price. Niche markets in the equipment industry need to be found and exploited. End-user equipment might not need to provide all of the available functions in order to ensure good performance in ICT connectivity. This trend is a further area to be worked on to narrow the Digital Divide. Inventing cheap but sufficiently sophisticated access equipment and making it available to the common user is an essential part of the Digital Divide policy agenda.

2. Infrastructure and Internet traffic flows[15]

Digital data communications are taking a more and more important role in telecommunications. In Mexico, for example, Data, Internet and Pay

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[13] ICT expenditure per capita in 2000: Argentina US$ 310; Brazil US$ 287; Chile US$ 371; Colombia US$ 231; Mexico US$ 196; Venezuela US$ 199 (WITSA, 2002).

[14] Considering ICT convergence has become a necessity in Latin America for successful business models, given the low PC penetration. Research shows that while in North America only 26% of retail banks offer customers access to their accounts via multiple devices (PC, telephone, wireless devices, etc), 43% of Latin American retail banks are doing so (Speer&Associates, eMarketer, 2002).

[15] This Subsection is heavily based on Francisco Gómez Alamillo's (General Secretary of AHICIET) presentation "Trafico de Internet", at the Expert Meeting "America Latina hacia la era digital", ECLAC, UN, Santiago de Chile, Nov.2001. AHCIET has kindly given

TV communications already made up 15% of the total telecom revenues in 2001 (with fixed voice making up 58% and mobile voice 22%) was rapidly increasing and was estimated to reach 33% in 2005 (Pyramid Research, 2001). While digital information is exchanged around the world through a network of large data centers and so-called "backbones", it often does not make a difference to the end-user which route data he takes. Once entered into an access network, the packet-switched data flow makes its way through different core networks of backbones until it reaches the access network of the recipient, where TCP puts the different IP (Internet Protocol) packages into their original order again. As difficult as it is to measure the different routes data flows take, —because little is known about them— even less is known about the severe consequences that Internet and telecommunications traffic flows can have on the development of the domestic telecommunications industry. The following section gives a brief outline of the present IP infrastructure and the current Internet traffic in and around Latin America and the Caribbean. The section examines regulatory conditions that currently monitor Internet traffic arrangements and briefly presents some of the scenarios and alternatives regarding the development of the IP infrastructure in the region that emerge from this framework.

An IP network clearly differs from the traditional circuit switched network (PSTN) in that IP is a packet network which delivers packets of information on a best efforts basis, while the PSTN allocates dedicated physical capacity on an end-to-end basis to a customer until the call is released. Over the next few years, a substantial amount of traffic is expected to move from circuit switched to packet carriage networks. The use of a packet switched protocol, IP, to carry the majority of traffic will have a profound impact on the structure of the industry, on the costs various players in the industry must bear and on the measurement of those costs versus the traditional methods.

Global Internet traffic grows dramatically by 100% per year. In Latin America this growth will be even greater, 110% per year. As a result of new access technologies and increasing bandwidth intensive applications, Ovum and CybeRegulation predict —in their recent study for Ahciet and Regulatel— that Internet traffic will increasingly dominate telecommunications traffic over the coming years, and radically change the telecommunications landscape across Latin America and the Caribbean. This substantial growth of Internet traffic will also modify the structure of the regional traffic matrix

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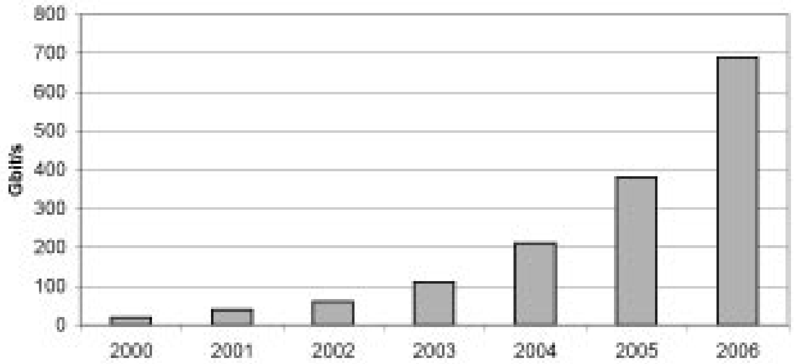
permission to cite the Report "Internet and Telecommunications Traffic Flows in Latin America and their Market Dynamics".

and the services originating from it and therefore, also the economic flow associated with it.

ESTIMATED TRAFFIC GROWTH (GBIT/S)



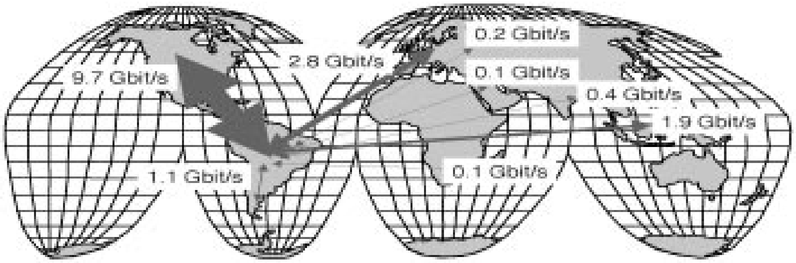
Source: AHCIET/REGULATEL (Hispano-American Association of Centers of Telecommunications Research and Enterprises/Foro Latinoamericano de Entes Reguladores de telecomunicaciones), «Internet and Telecommunications Traffic Flows in Latin America and their Market Dynamics» (http://www.ahciet.net/pag.asp?pag=ovum.asp), 2001.

The supply of broadband connectivity, both nationally and internationally, has historically been limited and expensive in Latin America but this is changing. Terrestrial and submarine fiber systems are being deployed which by the end of 2002 will provide the region with a 300 Gbit/s capacity, and will be potentially upgradeable to a 6.5 Tbit/s capacity, for inter-regional and intra-regional communications traffic. An additional 4 Tbit/s potential capacity is planned to be deployed throughout 2003. The increased supply had already begun to drive down prices in 2001.

This rate of content supply is sufficient to meet the current level of demand in Latin America. Supply is also stimulating demand by improving the users' experience on the Internet and at the same time significantly reducing the price of Internet access. However, reaching international Internet capacity levels from some of the more remote areas of Latin America will remain restricted for the time being because of limited capacity networks within the country. At the same time, the first Internet Data Centers have opened their doors, providing facilities for interconnection, peering and hosting within the region.

Until now, the Internet has been developing within a totally deregulated environment. However owing to the fact that the Internet is taking on an increasingly central position in the telecommunications market, there is good reason to review the suitability of the rules that are currently in force and adopt them to the new developing environment. A lot of countries, particularly those with less developed economies and those that are peripheral to the main Internet backbones in North America and Europe are calling for a complete overhaul in the charging rules upon which the Internet is based. While it is estimated that Latin America makes up around 6.4% of the worldwide Internet traffic (TeleGeography, 2002), almost 60 percent of this traffic is with North America (see graph).

INTERNATIONAL PEAK HOUR INTERNET TRAFFIC FLOWS TO AND FROM LATIN AMERICA IN 2001 (GBIT/S)



Source: AHCIET/REGULATEL (Hispano-American Association of Centers of Telecommunications Research and Enterprises/Foro Latinoamericano de Entes Reguladores de telecomunicaciones), «Internet and Telecommunications Traffic Flows in Latin America and their Market Dynamics» (http://www.ahciet.net/pag.asp?pag=ovum.asp), 2001.

To many observers outside North America, the current system of paying for the Internet is unbalanced and unfair. For Latin American Internet Service Providers (ISPs) this is because:

- Latin American operators pay for all (or at least the majority of) Internet connectivity between Latin and North America.

- Users outside Latin America benefit from being able to access Latin American content but do not pay for the connectivity to do so.

- There are other unreasonable situations, such as those involving Internet communications between Latin America and other countries and/or regions outside the United States. In these cases, due to the fact that the communications have to be rerouted through the backbones of the United States, not only the originating ISP but also the termination ISP has to pay the operators from the United States. This happens in spite of the fact that these backbones do not contribute or add any value to this kind of communications.

As a direct result of all of this, the net income Latin America received from the United States' FCC's[16] net settlement payments for switched voice traffic between the US and Latin America has been halved between 1995 and 2003 (from about US$ 2 billion to US$ 1 billion). As well as this, the cost of Internet traffic, generated outside Latin America and carried by Latin American operators, is increasing rapidly. Ovum and CyberRegulation estimate that if nothing is done about this situation over the next five years, Latin American operators will end paying more than they are receiving.

In their recent study, Ovum and CybeRegulation carried out an extensive survey of Internet charging arrangements with a large number of Latin American operators. From the answers they got they concluded that the majority of operators in the region do not peer[17] with their Tier 1[18] operators in North America. In other words, Latin American operators bear the majority of the costs of providing Internet connectivity to and from North America. Latin America needs to reach an agreement with the large ISP backbone Providers (Tier 1) in North America if they are to share costs. In other words exchange Internet traffic that terminates on each others network without charging each other to do so (peering).

Given the increasing importance of IP traffic, Latin American operators will have to continue to bear the brunt of Internet linkage costs for the next foreseeable future as long as they don't reach peering agreements with North American operators.. As the cost of Internet traffic between North and Latin America is increasing (costs almost tripled between 2000 and 2003), it is estimated that a *statu quo* scenario over the next few years could result in substantial losses for Latin American and Caribbean operators. One alternative would be to install one or several "Latin American hub(s)". The development of a major data center(s) in Latin America that acts as a hub(s) for regional traffic would ensure that less traffic would be routed through North America. This in turn would reduce the costs of links and Internet transit with North America. Another short-term alternative would be for Latin America and Caribbean operators to group together to strengthen their bargaining power to obtain transit and communication linkages at a discount through bulk purchasing. The objective would be to peer with North American Tier 1 operators, or at least to share costs based upon use.

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16 Federal Communications Commission.

17 Peering is where two IP (Internet Protocol) network operators agree to exchange Internet traffic for termination on each others network without charging each other to do so. It excludes traffic that terminates on another peering network.

18 A Tier 1 Internet Service Provider is a backbone operator and refers specifically to the very largest ISP backbone providers.

The different agents in the telecommunications sector need to be quick to take advantage of the opportunities as well as mitigate the negative aspects of the rapidly changing ICT Infrastructure. The current international connection payment scheme for Latin American and Caribbean operators with Internet main backbones is having important financial implications on the operators' cost chain and is adversely affecting the development of the sector in Latin America and the Caribbean. It deserves careful analysis.

In the past, international long distance traffic tariffs have been based on accounting rates and have generated positive income flows for Latin American operators. However, the accounting balance for telecommunications payments is not moving in favor of Latin American countries. This is not only because of the critical decline of settlement rates, but also because of the increase in IP communications. For example IP communications are rapidly migrating to voice communications, the payment for which is based on systems that do not suit developing countries and ignore the cost incurred in providing Internet services.

The most effective solution, and the most feasible one available, is a combination of different policy actions. National and regional trade unions or associations from the different sectors have to encourage all Latin-American operators connected to the Internet backbone in North America to collectively bargain with their northern neighbor. These negotiations require neither complex administrative formalities nor investments by the operators. A successful bulk negotiation could reduce the cost of Internet connections significantly over the next few years. Additionally, Latin American ISPs may lower their costs if they are able to collectively negotiate, as a region, the prices of links with North America.

Managing to reduce costs through collective negotiations will help the formation of Latin American Hubs, with sufficient capacity to peer with Tier 1. These Latin American Hubs need to be consistent in planning, implementing and operating to ensure they provide the best quality of technological service and have a wide ranging and modern architectural design. At the same time these hubs need to guarantee they actual save costs for all operators, which would be a political requirement for many countries to ensure they cooperate. Last, but not least, they should not lose sight of the main goal, to ensure that large and small providers of Spanish and Portuguese contents should be connected to the Hubs. The latter will ensure that traffic generated by these providers for Latin American users no longer passes through hubs of North American operators. All Latin American ISP and NAPs (Network Access Point) in the different countries ought to be connected to the Hubs.

The generation of a critical mass of ISPs, users, and content creators for the Latin American Hub, will increase the negotiating powers of Latin American operators and put them in a position to peer with North American Tier 1 operators. A "peering" agreement with at least one of the Tier 1 operators could reduce costs for domestic operators by an estimated US$ 3,339 million over the next few years and favor the development of ICT Infrastructure in Latin America and the Caribbean.

3. Digital television

Broadcasting and Telecommunications are inherently different and have kept to different fields in the past. Broadcasting falls into the category defined as "Information Technology" in the introductory Section. It deals with "one-to-many" transmissions and is best suited to distribution of audio/video/multimedia content. Broadcasting channels are unidirectional or asymmetric with a narrower band return path. On the other hand, telecommunications have traditionally dealt with "one-to-one" connections. The communications channel is usually bi-directional (duplex), and is more or less symmetrical in its upstream and downstream paths.

Applying digital technology to television —or the so-called digital television (DTV)— means merging broadcasting technology with the Information and Communications Technologies (ICT) family.

The idea of real-time communication being transmitted over digital infrastructure worldwide could have far-reaching socioeconomic effects. But digital television was not previously designed for interactive broadcasting. Initially it was thought that the driving forces behind the DTV revolution were to obtain a superior image and audio quality (often referred to as High Definition TV (HDTV)), and four to five times more efficient frequency use. Only in recent years has the focus of research moved toward compatibility between the "Internet", computers and cell phones.

Digital TV ICT Infrastructure can consist of both traditional fixed-line connections or wireless technologies (including satellite and terrestrial transmission). The International Telecommunications Union (ITU), recognizes three public platform standards in its reference model for digital television-ATSC, DVB and ISDB (ITU-R, 1996). The Advanced Television Systems Committee, Inc. (ATSC), was formed in 1982 in the United States. In 1996, the United States' Federal Communications Commission (FCC) adopted the ATSC Standard making its use mandatory for digital terrestrial television broadcasting in the country. Canada, South Korea and Taiwan later adopted the same standard (ATSC, 2001). Taiwan, however, changed to DVB in 2001. The European Telecommunications Standards Institute

(ETSI) sets DVB platform standards. All of Europe, the Arab States, Australia, Hong Kong, India, Israel, Malaysia, Singapore, South Africa, Thailand and Turkey adopted the DVB standard, which began operating in 1998 in England. Japan adopted ISDB (Integrated Services Digital Broadcasting), a modified version of the European DVB, in 1997. Both standards are based on the same modulation method for terrestrial broadcasting, known as COFDM (Coded Orthogonal Frequency Division Multiplexing). ISDB is created to fit the special characteristics of the Japanese market and in 2002 Japan was the only user of this platform.

Creating High Definition Television (HDTV) systems has been the main focus of the technological development agenda in the United States since 1987. Out of this emerged the ATSC standard. Since 1993, European DVB service development has focused on multicasting, which means transmitting multiple signals through the same channel. Different channels can now be viewed at the same time. The same platform is used for both, transmitting television signals and accessing the Internet. Only in 1997 did the Japanese adopt the basics of the European standard and modified it to suit special characteristics of the Japanese market. The Japanese version of ISDB is slightly more advanced in mobile communication. However, the ultimate objective is that one day a single terminal may be used for all of the different services (mobile, fixed, etc.).

The advantages of multicasting and interactivity over traditional broadcasting and telecommunications are their greater flexibility and variety. Two features that can be developed are the ability to program TV stations and interact with the running of a program. Common examples of digital TV features are "Video on demand", interactive game shows and special forms of e-commerce (through direct links to TV commercials). However, the infrastructure can also be used for e-learning, e-health and e-government services, amongst other things.

It is important to point out that the transition from analogue to digital television does not necessarily require buying new TV equipment. So-called "set-top boxes" are a cheap and efficient solution for "upgrading" analogue television sets. According to industry sources, such a converter could be manufactured at a cost of as little as US$ 120, depending on the level of interactivity (EU, 2002). This would be less than one quarter of the average price of a traditional computer in Latin America and the Caribbean in 2002.[19]

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[19] Given the average per capita income in Latin America and the Caribbean in 2000 was of US$ 3,836 (ECLAC, 2001b) a set-top box would cost only three percent of the average per capita income. A cheap computer would cost 13%!

(a) DTV in Latin America and the Caribbean

Television is an important part of Latin American culture and society. While Internet penetration reached 8.0% in the region in 2002, fixed-line telephony 16% and mobile telephony 18%, television penetration reached more than 27% per 100 inhabitants. That effectively gives more than 83% of the Latin American households access to television (ITU, 2000b). Over the last few decades television became a central and fundamental part of Latin American daily life. The introduction of digital television brings with it the great opportunity to overcome the often unfortunate, traditional cultural barriers Latin American countries have often encountered in adapting modern ICT Infrastructure. Digital TV could give millions of families the chance to interact with the world's global information infrastructure, through a very familiar and widely spread device, at an affordable price.

DIGITAL TELEVISION STANDARDS WORLDWIDE: ATSC, DVB, ISDB

The United States' standard ATSC is focusing heavily on introducing high definition TV (HDTV). However, many claim that HDTV is still very expensive. Some claim it would be too expensive to become a successful business model in developing countries for many years to come and advise against choosing ATSC. DVB has the advantage of being designed for terrestrial (DVB-T), satellite (DVB-S) and cable (DVB-C) transmission. In the U.S. —a country where most TV is delivered by cable— many satellite broadcasters use the European DVB-S, but the accepted standard for digital terrestrial TV is ATSC. The Japanese ISDB has advantages in mobile transmission. DVB is currently trying to make up for its shortcomings through intensive research into merging DTV with 3G systems. It is especially focusing on converging third generation UMTS telephony (the European standard for 3G telephony) and DVB. Supporters of DVB claim that this flexibility holds great advantages for content and application service providers, who will be able to use all four distribution channels (terrestrial, satellite, cable and mobile) without the need to configurate to different platforms.

It is worthwhile pointing out that the Japanese ISDB system was not commercially available when most Latin American countries were testing digital television platforms in 2000 and 2001. In Japan digital television broadcasters have started their services via satellite through DVB-S, while terrestrial services will not be introduced until 2003.

While DVB introduced a very simplified and minimal cost system regarding Intellectual Property Rights (IPRs) and the payment of royalties (DVB-LA), the prevailing uncertainty over the handling of these issues for ISDB and ATSC is still a crucial point.

Source: Martin R. Hilbert.

The first potential obstacle that arose was how to make the transition from existing analogue TV platforms to digital ones. In Latin American there is a diversity of analogue standards in the different countries. While Argentina, Uruguay and Paraguay have the PAL standard, Brazil opted for a unique solution and created PAL-M. The rest of South and Central America, the Caribbean and Mexico adopted the North American NTSC standard (see also Section "Technical Standards").

However, recent tests have laid to rest all doubts about technical difficulties in a transition from any kind of the four analogue systems to any of the three digital systems. A country's technological heritage should not be an obstacle. However, since there have been bad experiences in interchanging content between countries with different analogue standards, the need for one common homogeneous digital standard throughout Latin America and the Caribbean has become greater than ever.

Several countries in the region —especially Argentina, Brazil, Chile and Mexico— have started considering introducing digital terrestrial television. Various specifications need to be considered.

BRAZILIAN EFFORTS IN CHOOSING A STANDARD FOR DIGITAL TELEVISION

Brazil started procedures to choose a digital TV standard with a public opinion poll on July 27 1998. In January 1999, a Digital TV systems evaluation team composed of the Brazilian Society for Television Engineering and 17 television broadcasting concessionaires from the Brazilian Association of Radio and Television Stations (SET/ABERT), requested to test the Digital TV systems available at that time. The national telecommunications company, Anatel, then contracted a team of specialized technical advisors from the Telecommunications Research and Development Foundation (Fundação Centro de Pesquisa e Desenvolvimento em Telecomunicações-CPqD), to report on the tests on digital TV systems and technically advise Anatel in the evaluation process of the results.

The methodology and the chronology of the tests were discussed until August of 1999 by the Mackenzie Institute, the Evaluation Group for Digital TV Systems of SET/ABERT, Anatel, CPqD and representatives of ATSC and DVB-T. The tests done in Sao Paulo and Rio de Janeiro were divided in two stages: laboratory tests, which began in October, 1999, and field tests, which began in November of the same year. The objective of the laboratory tests was to evaluate aspects like "channel interference of digital TV on the existing PAL-M system", "tests related to the characteristics of equipment" and "tests on configurations for mobile applications", amongst others. Among the main aspects analyzed in the field were "coverage for outside reception", "coverage of digital TV channels TVs with analogue standards", etc. As well as these tests, some final system evaluations were conducted on areas such as "technical aspects" including planning, re-use of frequencies, flexibility in services provision. Evaluations were also done of "social, market and economic aspects", including the production of local content, telecommunications operators, impacts on the Macro-economy of Brazil, international implications, etc.

The SET/ABERT Evaluation Group concluded tests of the three dominant standards ATSC, DVB-T and ISDB-T in April 2000. One important factor that presented difficulties was the high cost of laboratory and field tests.

Source: ITU-D Study Groups, "Brazilian Efforts in Choosing a Standard for Earth-bound digital television"; National Agency of Telecommunications (ANATEL), (http://www.itu.int.), September 2000.

The first country in Latin America that took a decision regarding digital TV was Argentina, which —through its premature choice of the U.S. ATSC standard in 1997— caused some controversy with its MERCOSUR partners (Secom, 1997). Afterwards Argentina withdrew its decision, and said it would wait until other countries in the region had concluded their evaluation phase before taking a final decision.

The largest and "most complete tests in the world" (SET/ABERT, 2000) of digital television platforms, have been carried out in Brazil. The results of these tests caught the world's attention and are the main reference points for many countries around the globe, which have still not decided which digital TV standards to adopt.

A research group set up by the national association of broadcasters, ABERT, and the television engineering society, SET, came to various conclusions about the tests. The European and Japanese standards for the modulation method had clear advantages over ATSC, especially in highly populated areas, which is a decisive factor for a largely urbanized country like Brazil. According to the report, the United States' ATSC model could not provide the "technical minimum requirements" for Brazil, due to the low performance of its multipath reception and its relative inflexibility. Furthermore, the Japanese ISDB-T solution showed significant advantages over DVB-T in accessing the system through mobile technology.

"In spite of the ISDB-T's technical superiority and the system's greater flexibility, there are other aspects that must be considered, such as, the impact the adoption of each system will have on domestic industry, the conditions and features of each system, the time to market each system, the cost of the receivers for the consumer, forecasts regarding reductions in receivers prices, for purposes of enabling the most rapid access possible to all segments of the population," (SET/ABERT, 2000). Once it had concluded the test phase, Anatel said on various occasions that it would have to carefully consider, not only technological aspects, but also issues concerning the domestic industry, before the regulator could make a final decision.

Mexico, which recognizes the results of Brazil but is geographically and commercially strongly bound to the United States, is looking at the possibility of introducing a hybrid approach between ATSC and DVB. This is reminiscent of the Brazilian experience with analogue video standards. Brazil's unique PAL-M standard, which it developed in the 1970s, was a hybrid of European and United States standards. It produces excellent images but Brazil is the only country in the world using it.

In November 1999, Chile's Subsecretary of Telecommunications (Subtel) and the National Television Council (CNTV) concluded a study about the proposed normative framework that would be needed to regulate digital TV and the estimated economic impact digital TV would have on the country (Subtel and CNTV, 1999a, 1999b). Though it did not provide concrete data, the study raised the interesting question of whether the introduction of digital television, besides providing higher technological quality TV with some additional services, should not also serve as an effective tool to incorporate important sectors of the economy and society into the worldwide Information Society? It underlined the possible trade-off between quality improvements through High Definition TV (HDTV) (preferably the United States' ATSC standard) and the introduction of multicasting and interactivity (preferably the European DVB). The study raises the question of whether the Chilean population would be able to pay for advanced HDTV as it would require expensive high resolution TV sets. It also points out that Chile neither produces its own technology nor has a large content industry and therefore is highly dependent on international economies of scale, which determine the cost and support the constant improvement of a technological system. The final definition for digital TV remains very broad in the Chilean case.

In Summary, for many countries, making a decision about which platform standard to choose goes far beyond technical considerations. Many other issues need to be looked at, such as, the impact of digital TV on the domestic industry, whether to produce equipment locally, the balance of the cost of installing the technology compared to the profits to be made, and when is the best time to market each system. Any decision also needs to consider the cost of the equipment for the consumer, an estimated time-scale for the equipment to come down in price and other factors that could help this technology spread universal access to the global information network.

Some of these considerations were also taken into account when countries were deciding on which standard settings for analogue television to choose in the 1970s. Valuable lessons can be learned from those experiences (see also Section "Technical Standards"). Perhaps the most valuable lesson was the need for a common regional standard. As with all Information and Communication Technologies, success or failure of digital TV could hinge on reaching the crucial "critical mass" and scale as fast as possible. This can be achieved through international economies of scale in this industry that may lead to progressively cheaper equipment right from the start. And the increased digitization of the different Vertical Sectors can bring benefits to the economy which go far beyond the initial, positive aspects that a growing TV production industry entails.

(b) Middleware

As with PCs and advanced digital cell-phones, digital televisions need some kind of software in the “Generic Services Layer” to link it to the Infrastructure Layer. API (Application Programming Interface) is the interface between the digital service tool used by the end-user and the machine’s operational system. Some vendors refer to API as middleware. API carries out the interface function between an application program created by a company and the hardware-operational system created by another company. It is the integral link between the Infrastructure Layer and the Generic Services Layer.

In order to assure interoperability between the Infrastructure Layer and the Generic Services Layer, several groups defend the development of an API with open standard, to avoid “lock-in” effects or bottlenecks in accessing information (see also Section “Technical Standards”). There are fears that interactive television content providers could be deterred from producing digital services if they have to develop them for a number of different software platforms, even within one national market.

According to the current business model for digital television services a subscriber or consumer to a digital TV service needs to buy or hire a decoder that runs a “proprietary” middleware software system. Proprietary software simply means that the software’s source codes are the protected property of an individual company. Consumers can only access the interactive content offered by one platform operator at a time. If consumers want to receive interactive content from third parties, they need to buy or rent additional receiving equipment from an alternative platform operator. But this new supplier again locks them into its particular services on an exclusive basis, preventing consumers from accessing alternative content as well. There are growing concerns about undesired “lock-in” effects. For content suppliers who do not operate their own technical platform, the present situation means that they have to contract a platform operator using a proprietary technology so their interactive services can be carried to the consumer. The result is an exclusive vertical integration revolving around platform operators.

As the trend in digital television moves towards providing retail services, the importance of having open standards becomes essential to ensure that the subscriber’s or consumer’s investment in their decoder is protected as well. The demand for open standards within the world of decoder middleware systems has resulted in the emergence of several open standards in the United States and Europe (DASE, ATVEF, MHP, etc.).

DVB, for example, approved and promotes the use of the Multimedia Home Platform (MHP) as an open standard middleware. The MHP creates a generic interface between the interactive digital services and the terminals on which those applications are carried out. It enables digital content providers to access all types of terminals ranging from low end to high-end decoder boxes. MHP can be used as one single platform to receive digital television from different operators. MHP has been adopted as the national standard by all Scandinavian countries as well as Germany, Singapore, Australia and the United States' Open Cable Consortium. The European Commission is actively promoting MHP as the standard for the European Union.

The decision about open or proprietary systems with regard to Middleware and to service and content provision for digital TV also has to consider the social and political weight that television carries in Latin America (see also Section "e-Media"). Apart from all the hype about the technological nuances and platforms of digital television, the discussion has to move on toward solving the problems of interactivity, service programs and quality content. The ICT-for-development concept has to become the center of attention for a technology that might directly affect up to 90% of the Latin American population directly, in the near future.

4. Mobile communications[20]

Mobile cellular communications can be a decisive factor in accelerating the creation of an Information Society in Latin America and the Caribbean. Since the late 1980s, this technology has allowed mobile telephony to become a major provider of basic telecommunications services. Its mobility, easiness to instal, and competitive costs have led to the creation of a new concept in mobile telephony that provides basic voice and data services.

New mobile cellular communications technologies are transforming the mobile telephone from being a mere communication system to a recognized member of the Information and Communication Technologies (ICT) family. Mobile communications have become a new way of reaching the "heart of the Information Society", which is the digital network of networks (Internet). The wireless family embraces a large selection of technologies which are evolving very fast, such as satellite, or other fixed-wireless solutions such as Wireless Local Loop (WLL) and Local Multipoint

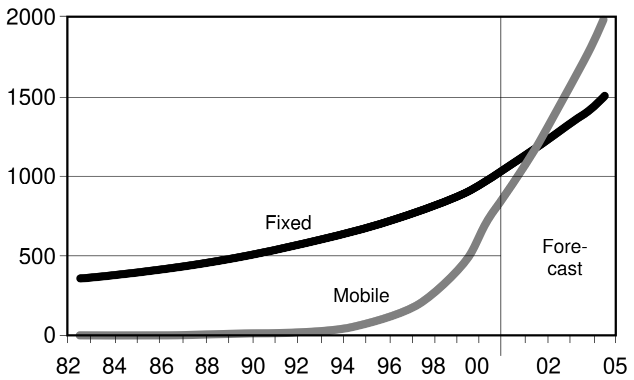
[20] This section was written in cooperation with Richard Downes (Director for Latin America and the Caribbean; 3G Americas LLG).

Distribution Services (LMDS). The future will see a convergence of wireless systems, seamless interoperability among the different technologies, and automatic switching to the connection that provides the user with the most cost-effective transmission rate. However this section will only focus on mobile cellular networks, given their current dominant position.

(a) Mobile telephony: The market and its evolution

With nearly one billion global subscribers at the end of 2001, the number of mobile users is poised to surpass fixed lines in service in 2002. Almost one in every six of the world's inhabitants had a mobile phone at the beginning of 2002, and almost 100 countries had more mobile than fixed telephone subscribers (ITU, 2002).

MOBILE AND FIXED TELEPHONE SUBSCRIBERS WORLDWIDE, 1982-2005

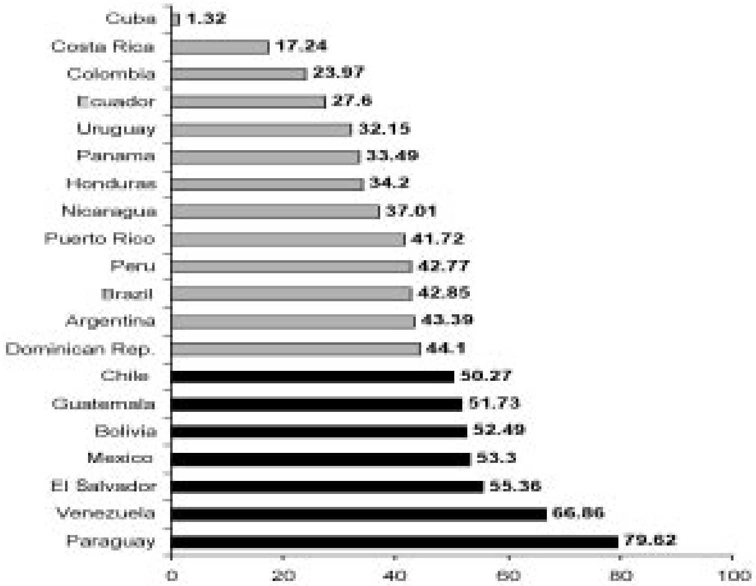


Source: ITU World Telecommunication Indicators Database and ITU projections.

The ability of mobile communications to equal, in just two decades, what has taken over a century to achieve from investment in fixed-line telephony is due to combination of factors. Mobile systems can be installed rapidly and at a lower cost, and have pre-paid cards and "calling-party-pays" models. In addition, strong international links between the companies of the mobile industry has helped make it a success (ITU, 1999a).

These advantages have allowed unexpectedly high growth rates in the region. From a mere 59,000 subscribers in 1990, mobile services have expanded to over 90 million users throughout Latin America and the Caribbean and have surpassed wired line penetration in at least Paraguay, Venezuela, El Salvador, Mexico, Bolivia, Guatemala and Chile. The rest of the region (with only few exceptions) is expected to equal wired line penetration in the very near future.

MOBILE TELEPHONY LINES AS A PERCENTAGE OF TOTAL TELEPHONE LINES IN LATIN AMERICA AND THE CARIBBEAN COUNTRIES, 2000



Source: AHCIET (Hispano-American Association of Centers of Telecommunications Research and Enterprises), «Benchmarking 2001», Analisis comparativo del sector de las telecomunicaciones en Iberoamerica, Madrid, Price waterhouse Coopers, April, 2002.

Mobile radio technologies have evolved through a variety of "generations". The first generation (1G), which has been in use since the early 1980s and is still common throughout Latin America today (around 20% of mobile telephony subscribers in 2001), is based upon an analogue mode-the transmission of radio waves through frequency modulation over dedicated frequencies. Advanced Mobile Phone Service, commonly called AMPS, has been largely supplanted by a second generation (2G) of multiple digital technologies that employ different and largely incompatible radio interfaces: Code Division Multiple Access (CDMA); Global System for Mobile communications (GSM), and Time Division Multiple Access (TDMA). In Latin America, the most common standard is TDMA (59% of the Latin American mobile market). This makes up for more than 53% of TDMA subscribers worldwide. Since TDMA never reached sufficient economies of scale in the international market and given other advantages of GSM and CDMA, the TDMA evolution path is practically coming to an end (see Section "Technical Standards" in the Regulatory Framework

Section). Operators all over the region are busy switching to the GSM or CDMA evolutionary path to obtain packet data transmission capabilities. This upgrade requires significant investment that operators in low-income regions may find burdensome.

A third generation (3G) of mobile telephony technology has arrived under the name IMT-2000 (see www.imt-2000.org), characterized by higher data transfer rates, the use of Internet Protocol (IP) technology, and the capacity to access the Internet wirelessly.[21] An intermediate migratory phase between the second and third generation, known as "2.5 G" is now being deployed through the region (being pioneered in Brazil, Chile, Mexico and Venezuela). It features a wider variety of data-based services, such as electronic mail, short messaging, and mobile Internet access, although at slower data rates than those inherent in 3G.

The arrival of 2.5G and 3G services facilitates connectivity not only through higher data transfer rates, but especially because it frees the user from dependence on the small screens of mobile terminals. The creation of large-screen mobile terminals that are hybrids of personal organizers and mobile phones ("smart phones") and the enlargement of the screens of even mass-market mobile phones are giving users greater capacity to exchange data on the move today. With the installation of wireless modem cards, users of 2.5 and 3G services are able to use the wireless interface with a variety of devices, including lap tops and other computers. Thus, the arrival of 2.5G and 3G technologies can play a major role in facilitating the connectivity inherent in the concept of an Information Society. The marriage of these advanced wireless technologies with simple computer devices, such as the "Simputer" from India (see Section "Digital Divide" in this Section) could herald the beginning of a new era of wireless connectivity for consumers of even modest means throughout the region.

(b) The Mobile Divide

The environment, in which investors in Latin America and the Caribbean are seeking returns, already presents major challenges to

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21 Market forces will facilitate the use of advanced wireless services by reducing the number of radio interface standards. With TDMA technologies gradually being replaced, there are basically two potential solutions. One is to follow an evolutionary path based on the open GSM technology (with GPRS and EDGE as 2.5G and UMTS (WCDMA) as the 3G solution) and the other is based upon a proprietary CDMA solution known as "CDMA2000." Market data indicates that nearly 90 percent of the world's 3G market will adopt the 3G solution based on GSM technology, but in the Americas the CDMA solution will probably retain approximately 30% market share. Both offer the ability to achieve high rates of data transfer (between 144 kbit/s and 2 Mbit/s) and additional capacity for wireless operators.

profitability, especially in rural countries and in those with highly skewed income distribution patterns. The characteristics of mobile wireless transmission favor densely populated urban areas. Mobile base stations provide wireless coverage through a honeycomb pattern of hexagonal cells, each with a radius of 1.8 miles. Coverage radii can be expanded for areas where traffic is less dense, but generally there is a positive correlation between the amount of geographic area to be covered and the cost of infrastructure. The fewer subscribers per cell site, the higher the cost of providing coverage, and vice versa. Thus, dense urban environments offer the most cost-effective environment for the mobile operator and scarcely populated rural environments, especially those away from major transit routes, are the least attractive. Logically, the installation of mobile telephony has generally occurred in regions of high urban density.

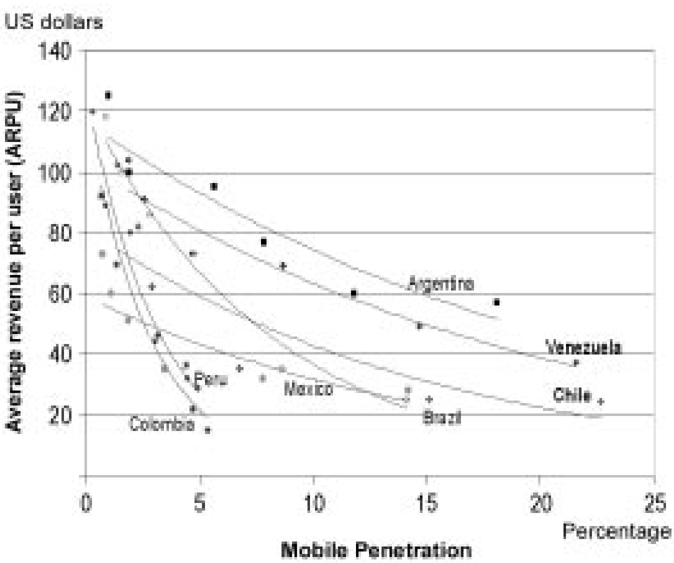
MOBILE PENETRATION PER TOTAL INHABITANTS AND DEGREE OF URBAN CONCENTRATION, 2001

Country	**Mobile Penetration (percent)**	**Urbanization (percent)**
Haiti	1.1	38.1
Nicaragua	3.0	55.3
Honduras	3.6	48.2
Ecuador	6.7	62.7
Costa Rica	7.6	50.4
Peru	5.9	72.3
Colombia	7.6	74.5
Bolivia	9.0	64.7
Guatemala	9.7	39.4
El Salvador	12.5	55.2
Dominican Rep.	14.7	70.4
Uruguay	15.5	92.6
Brazil	16.7	79.9
Argentina	18.6	89.6
Paraguay	20.4	56.1
Panama	20.7	57.6
Mexico	21.7	75.4
Venezuela	26.4	87.4
Chile	34.0	85.7

ITU (International Telecommunication Union), World Telecommunication Indicators Database, 2002. ECLAC (Economic Commission for Latin America and the Caribbean), Foreign Investment in Latin America and the Caribbean (LC/G.2125-P/E), Santiago, Chile. United Nations publication, Sales Nº S.01.II.G.12, 2001a.

Similarly, the highly disparate income levels within the region have discouraged expansion of mobile systems in poorer countries. Operators prefer to acquire customers in the top income segments. The highly skewed income patterns in the region[22] imply that with an increasing market penetration, revenues for operators fall dramatically (see graph). The region's "average revenue per user" (ARPU) is US$ 25 per month, one of the lowest in the world (only Africa has a lower ARPU).[23] This brings operator incomes down to a level, normally only seen once "market saturation" has occurred. However "universal service" of mobile phones is still far from being achieved. With a cell phone penetration of around 30% in Chile and Venezuela in 2002, for example, "fears" about "market saturation" already are part of the discussion.

AVERAGE REVENUE PER USER (ARPU) VS. MOBILE PENETRATION IN LATIN AMERICA



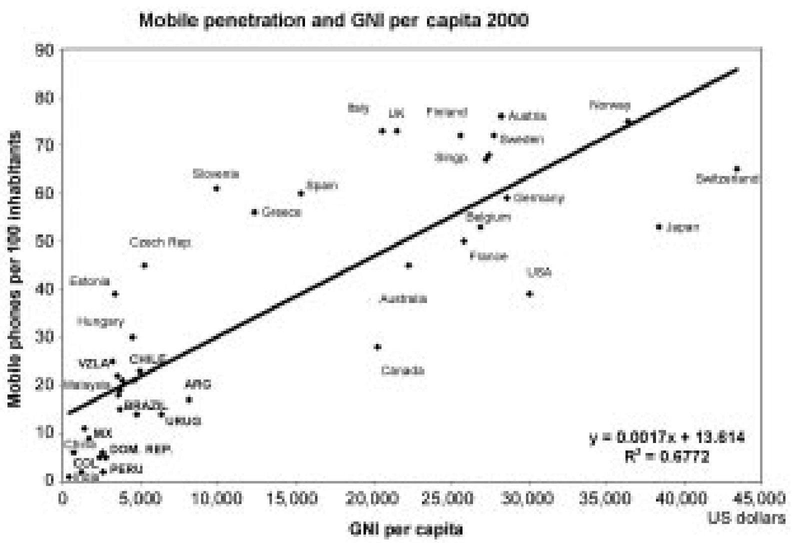
Source: Yankee Group, official website (http:/www.yankeegroup.com), 2000.

22 Roughly speaking the richest 20% receive 50%-60% of income in Latin America and the Caribbean, while the poorest 60% obtain 20%-30% (ECLAC, 2001b).

23 The low ARPU is mainly due to the fact that the vast majority of new subscriber growth has consisted of prepaid customers who use their service only sparingly, often depending upon the "calling-party-pays" policy to receive calls at no cost (e.g. 65% of the Brazilian subscribers are pre-paid). Such customers add little to the operators' bottom line profit margins. Pre-paid customers spent as little as US$ 8.26 per month for their service, while post-paid users were willing to pay three times as much on a monthly basis.

As with Internet and PC access, the strongest barrier to the widespread adoption of mobile technology is low per capita income. The following graph shows the strong positive correlation between income per capita and mobile telephony penetration. Similar to what has already been observed with Internet access in a previous section of this chapter, it seems natural that those countries with a lower income per capita, also have significantly lower ICT usage rates.

MOBILE PENETRATION AND INCOME PER CAPITA



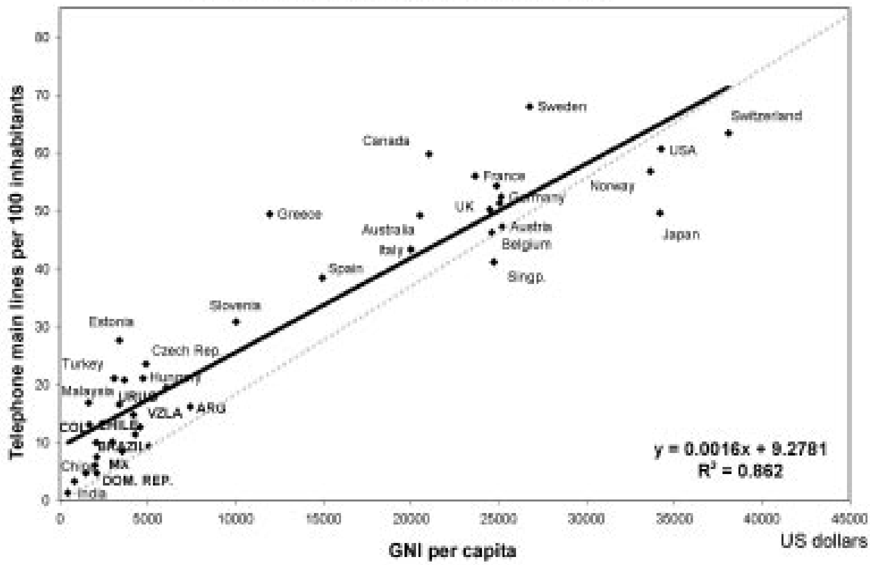
Note: sample of 42 countries from five continents.

Source: Martin R. Hilbert, based on ITU (International Telecomunication Union), World Telecommunication Indicators Database, 2000b.

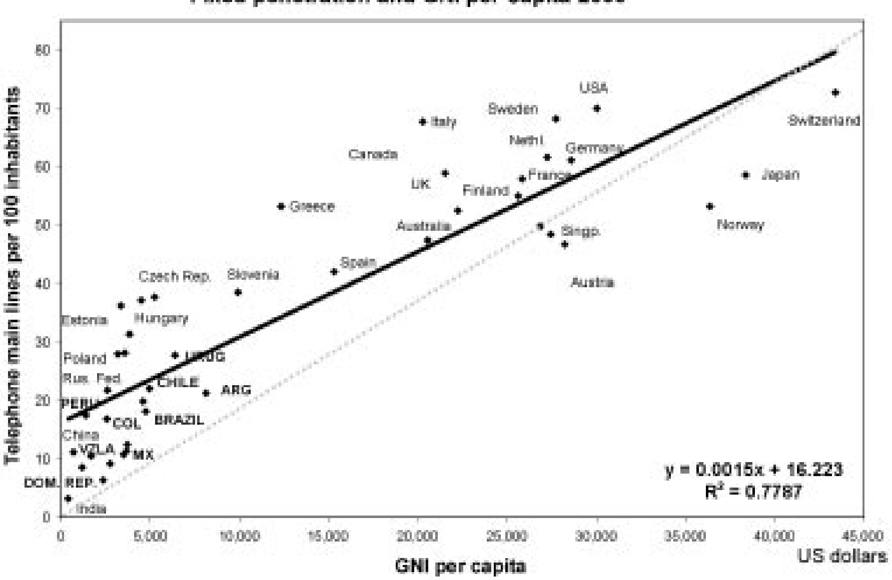
However, it could be expected that the relatively low costs of mobile networks allow for a faster spread of mobile technology when compared to the traditional fixed-line telephone network. This would imply that over time, low-income countries (which are shown in the lower left corner of the graph) would move upward (in the direction of the upper left corner of the graph) a lot faster when comparing mobile penetration and income level, as when comparing fixed-line telephony penetration and income levels. Data from 1995 with 2000 shows that the distribution of fixed-line telephony networks improved only marginally (see left hand graphs). In absolute terms, telephone mainline penetration all over the world (in low-income and high-income countries) improved only slightly. However it is a very different story if we compare the increase in worldwide distribution of mobile telephony in the same period (see graphs below).

ALSO LOW-INCOME COUNTRIES MADE SIGNIFICANT ADVANCES THROUGH MOBILE TELEPHONY

Fixed penetration and GNI per capita 1995



Fixed penetration and GNI per capita 2000



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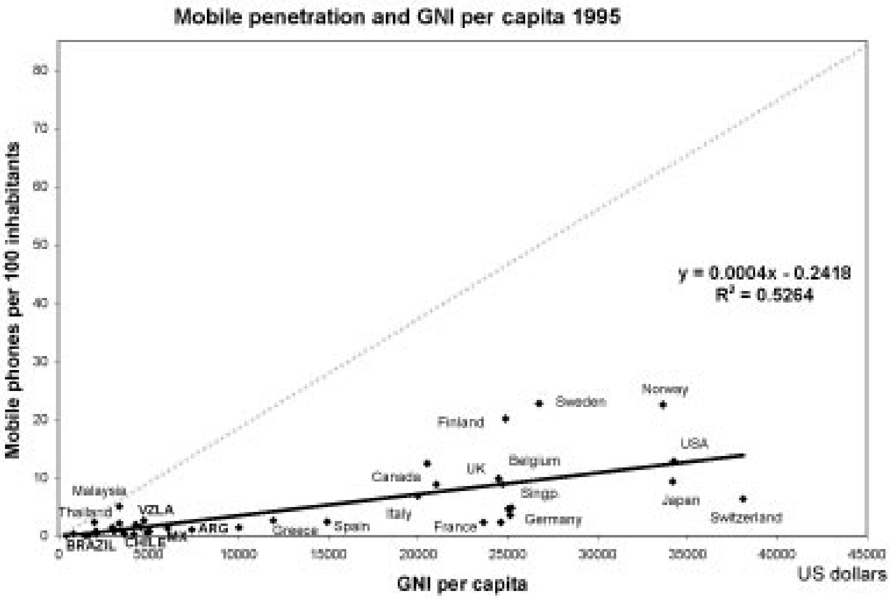

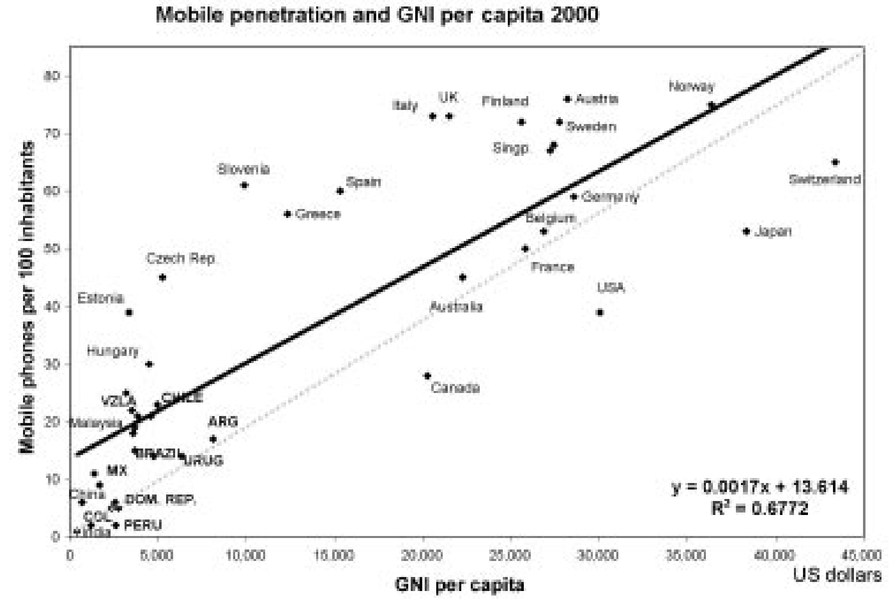

Note: sample of 42 countries from five continents.

Source: Martin R. Hilbert, based on ITU (International Telecomunication Union), World Telecommunication Indicators Database, 2000b.

The spread of mobile phones between 1995 and 2000 was greatest in high-income countries. While many high-income countries had a mobile penetration of less than 10% in 1995, a lot of them reached penetration rates of 60% to 70% in 2000. However, the global boost of mobile telephony also trickled down to low-income countries. Starting with a quasi non-existent mobile penetration in 1995, many countries in Latin America and the Caribbean had already reached a mobile penetration of more than 10% in 2000.[24]

A more specific example from Chile demonstrates how mobile telephony can help narrow the Digital Divide. In November 2000, 52.6% of Chilean households had fixed-line phones, 24.5% had both fixed-line and mobile telecommunications and 14.6% of Chilean homes had only a mobile phone and did not have fixed-line phones. With mobile telecommunications, the total number of homes with access to some sort of telecommunications was raised to 67.2%.(Subtel, 2002).

Despite the problem of urban concentration of mobile networks, mobile systems are useful in linking up rural areas. In the example of Chile, only 2.2% of fixed-line telecommunication infrastructure reaches homes in rural areas while 8.4% of the country's mobile telephones are found outside the urbanized areas. Thus, mobile telephony also facilitates access to telecommunications in rural areas (Subtel, 2002).

This potential of mobile telecommunication has to be exploited more, especially in low-income countries in Latin America and the Caribbean. As the graph "mobile penetration and income per capita" above shows, the Americas region is relatively far behind in adopting mobile telecommunications, compared to other countries. All countries in the hemisphere (including the United States and Canada) are way below the "international average" in relation to income and mobile penetration (with the exception of Chile and Venezuela). Many countries, especially in Europe and Eastern Europe, have less per capita income, but are adopting mobile telecommunications at a much faster pace. This suggests the vast growth potential of mobile communications in the years to come.

Though there may be a positive outlook for mobile telecommunications in Latin America and the Caribbean, profitability of this dynamic mobile industry is necessary if the market is to keep growing at a sustained pace. On the one hand, high competition in the industry (such as in Chile) seems

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[24] Namely Panama (12%); Uruguay (13%); Mexico (14%); Brazil (14%); Paraguay (15%); Argentina (16%); Venezuela (22%); Chile (22%).

to favor low access prices and a relatively high mobile penetration that creates greater demand, which then obliges operators to quickly innovate with new services (like 2.5G) (see Petrazzini and Hilbert, 2001). But on the other hand, as a result of these factors, mobile operators are facing problems justifying large investments with low traffic volumes, decreasing ARPU, and low revenues from subsidized handsets with pre-paid systems. Operators may not be able to continue justifying further investments in building-out their networks and as a result expansion in the market may slow down.

(c) Regulatory Challenges

The regulatory challenge for mobile communications has to start by raising awareness about the potential of the innovative technological system. The approach of many nations in the Americas conforms to a recent ITU observation that "most governments and regulators only have fixed telephony in mind" when contemplating extending access to telecommunications (ITU, 1999a). The Organization of American States' Inter-American Telecommunication Commission (CITEL), formed in 1993, when wireless services were still a novelty in the region, has given priority to wireline services. There are 34 governments and 200 associate members in the Organization of American States. Although CITEL is dedicated to making "telecommunications a catalyst for the dynamic development of the Americas" by "strengthening of the telecommunication networks and services in the Americas" (CITEL, 1994), its compendium on Universal Service in the Americas countries overwhelming focuses on extending wireline (but not wireless and mobile) services through official subsidies. Indeed, even ITU and CITEL measuring sticks for the degree of universal telecom services in each country, overlook the substantive contributions being made to true universal service by the mobile phone industry (CITEL, 2000).

As most countries tend to promote investment in fixed-line infrastructure, rather than mobile infrastructure this rules out the possibility of mobile operators receiving subsidies from the public sector to install mobile communications for non-profitable customers in rural or low-income areas. "Universal service funds" clearly discriminate against mobile services.

The most common and heated discussion amongst mobile communications players is regarding spectrum allocations and licensing processes. When countries award mobile licenses, they usually take one of the two basic approaches. Some choose auctions, in which bidders determine the value of the spectrum by competing with each other and the license goes to the highest bidder. Others opt for "beauty-contests" in which

LOW CONSCIENCE ABOUT THE MOBILE OPPORTUNITY IN LATIN AMERICA AND THE CARIBBEAN

The lack of attention to the potential contributions mobile technology can make is also apparent in recent declarations from the Summit of the Americas process. The last three meetings of the chief executives of the American states, held from 1994 to 2002, year have produced elaborate action plans calling for the improvement of telecommunications services with little reference to mobile services. At the Quebec meeting, in 2001, regional heads of governments called for the "modernization and expansion of telecommunications infrastructure in rural and urban areas through the timely introduction of new technology and services." (Summit of the Americas, 2001a). The ten major elements of the Quebec Summit telecommunications action plan do highlight the role of some technologies —such as satellite and Interest based— as important means of meeting broader regional goals, but they make no reference to wireless technologies, other than the need for "attention to spectrum management."

The potential contributions of mobile technology also seem to have gone unnoticed by national entities looking at the national and regional connectivity needs. Canada's contribution to "Connecting the Americas" program is the Institute for Connectivity in the Americas makes no mention of wireless technology. The Brazilian government's August 2000 publication of its "Green Book" is a comprehensive and serious effort to review the action that need to be taken to stimulate the Information Society in Brazil "in all its aspects" (SocInfo, 2000). Its discussion of wireless and mobile technologies, however, is extremely limited, despite admitting that the future role of "cellulars" and the Internet is a "captivating global trend" (SocInfo, 2000).

Source: Richard Downes.

the government awards licenses to the proposals they find best fit certain criteria (see also ITU, 2001c). While "radio frequency spectrum", which is a scarce natural resource, provides governments with a welcome opportunity to fill up public sector cash registers, experience shows that high minimum license fees may also discourage additional investment, and therefore harm the development of the sector. Through beauty contests, on the other hand, the government telecommunications regulators can establish criteria that "encourage" operators to present network coverage plans that also connect rural and low-income areas. Through a beauty contest, operators compete to provide the best performance and universal access which evidentially supports development of the mobile industry. However, with an auction, operators are charged large amounts just to participate and so have to try to exploit the market as best as they can, to recover costs (Petrazzini and Hilbert, 2001). However, it is often not the telecommunications regulator but the Finance Ministry which has the last say in handing out spectrum licenses and which finally chooses between an auction or a beauty contest. This is a worldwide phenomenon and has had severely negative consequences on the mobile industry. The absurdly high licensing fees charged for 3G in Germany and the UK is a case in point.

THE CHALLENGE OF UNIFIED SPECTRUM ALLOCATION

An essential factor to consider when licensing mobile services is the spectrum allocation, especially as the region moves toward 3G services (Hilbert and Petrazzini, 2001). Operators fear that without common spectral bands in different countries, this will limit cross-border compatibility and the development of economies of scale, which are necessary for creating cheap terminals and infrastructure. In order to maximize the use of economies of scale in end-user and infrastructure equipment, countries in Latin America and Caribbean countries need to avoid isolating themselves, by licensing mobile services in rarely-used frequencies. The five candidate bands for 3G services (806-960 MHz, 1710-1885 MHz, 1885-2025 MHz, 2110-2200 MHz and 2500-2690 MHz) identified in May 2000 by ITU (International Mobile Telecommunication-2000 IMT-2000), seem to have left the region with too many options. The main problem is that many countries in the region introduced 2G services in the 1900MHz band (or the so-called PCS (Personal Communications Services), a frequency which has been reserved by Europe and the majority of Asia (the worldwide leaders in mobile telecommunications) for introducing 3G services (through UMTS; W-CDMA). This leaves some regional countries with little room left on their PCS bands to introduce 3G. Argentina, Bolivia, Colombia, Costa Rica, El Salvador, Guatemala, Haiti, Honduras, Mexico, Paraguay, Peru, Puerto Rico and Dominican Republic have recently licensed PCS operators in the 1900MHz band-and Chile and Uruguay are planning further PCS licensing. The Uruguayan regulator says that it is up to the operator to decide whether or not to use the 1900MHz spectrum for PCS or for 3G services. As a result, this has left governments in several countries of the region with complex decisions to take regarding the allocation of 3G spectrum. The 806-960MHz and 2500-2690MHz bands, has also been identified by CMR-2000 for IMT-2000, are used by other telecommunications services in most countries. The Brazilian regulator ANATEL took an important decision in March 2002 to remove WLL services (Wireless Local Loop) from the 1900MHz band, in order to create room for Third Generation services in the 1920MHz-1980MHz band, to ensure compatibility with the European 3G frequency band (Anatel, 2002).

Source: Martin R. Hilbert.

Is countries progress on the long road to introducing IMT-2000 technology, another dilemma has entered the equation. Which of the multiple bands for implementing 3G technologies should they choose from? Latin America and the Caribbean could potentially pick any of five different bands. To gain the maximum efficiency from the use of new spectrum within the region, it becomes necessary to narrow down that list of spectrum bands to a select few. Intense discussions within CITEL are making progress. However, major roadblocks, such as the United States' indecision on which band to select, have held up the designation of additional spectrum. In order to advance in this issue regulators are going to have to use a more aggressive approach to reaching agreement on one common spectrum for this and other future technologies.

B. Generic services

The "Generic Service Layer" builds on the "Infrastructure Layer". Digital activity first of all requires a physical network of hardware components, and secondly software services, which enables the usage of the hardware. This does not make the "Generic Service Layer" a second row issue. The importance of adequate service tools is often underestimated and overshadowed by discussions about access to the physical infrastructure. However, the most advanced broadband infrastructure is of little use if available service programs are ill equipped, wrongly employed or simply not affordable.

As the connecting link between the physical infrastructure (Infrastructure Layer) and the different Vertical Sectors (Intermediary Layer and Fulfillment Layer), the Generic Service Layer depends on the characteristics of both of them. It has to meet the requirements of the hardware components in use (available bandwidth, portable or fixed, individual or collective, memory and data processing capacity, etc.) and it needs to consider the final end of its usage. An entertainment service tool in the Vertical Sector of "e-media" —such as RealPlayer, QuickTime, Media Player or Napster— (see also Section "e-Media") certainly has to meet different expectations than an e-government application —such as online tax paying programs, B2G marketplaces, electronic voting platforms, etc.

The provision of adequate applications is a major issue. Market mechanisms alone are often not sufficient to create programs and tools in order to achieve broader development goals. The market may produce video games and adult entertainment, but it is not necessarily producing adequate software programs to confront local needs in health care or educational services. This is a classic example of market failure that could call for government intervention.

The wide-ranging approach that is used in this book to demonstrate the implications of the digitization process in the Information Society, demonstrates that digitization of information and communication goes far beyond the economy. Considering the various Vertical Sectors affected (such as e-government, e-health, e-education, e-media, etc.), a wide variety of different service tools are required. The following chapter however, focuses primarily on software programs that are used for economic purposes, as means to support business administration and for productive processes. This Vertical Sector has been chosen since e-business software is undoubtedly the most advanced at the present moment. As a consequence of its leading position, users in other sectors (especially in e-health and e-government) adapted the basic ideas behind business applications, modified them according to their individual interest and put them into service.

The following section describes the basic concepts of business software tools and their intended purposes. Then, a section about software implementation analyzes the complex process of inserting information systems into a company and shows the complexity of the digitization process. Finally, the last section presents a new kind of industry, the application service industry that seems like an adequate solution to provide high quality digital service tools in Latin America and the Caribbean.

1. Business applications[25]

The following section is intended to provide a short summary of the evolution from the classic MRP (Material Requirement Planning) system, through ERP (Enterprise Resource Planning) systems, to the world of Collaborative Commerce, which includes a combination of CRM (customer Relationship Management), SCM (Supply Chain Management), and BI (Business Intelligence) to finally Collaborative Marketplace scenarios. Such programs present ideal case models, which can be deployed through different technological solutions, with varying degrees of sophistication. At the beginning of 2002, for example, a “world-class” ERP solution cost between US$ 100,000 and US$ 2 million. While this section uses such a world-class solution as the reference model, only a small group of companies in Latin America and the Caribbean (mainly large companies) can actually afford to obtain such sophisticated technology. Small-and medium-sized enterprises might rather employ partial solutions, which are not as complete as world-class systems. However, the section aims at presenting a general overview about the evolution of business applications, and underlines the paradigmatic significance that introducing digital service tools has for the business sector.

This evolution started around the 1960s, with the advent of the use of computers in the manufacturing environment. So-called Material Requirements Planning, or M.R.P., integrated part of the manufacturing process itself as the basic principle. In the early 90’s, ERP came of age. Everyone, who could afford it, had to have the much sought after ERP packages operating in their businesses. Since then, Web and Internet technologies have matured, with CRM at the front end, and e-Procurement and Supply Chain Management at the back end. ERP has extended backwards, outside the organization through e-Procurement (electronic

[25] This Section is a contribution from Iain Ballesty and Sven Rusch from SAP Chile.

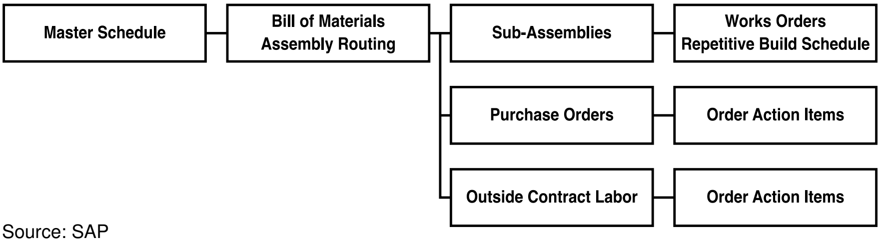
Purchasing) and Supply Chain Management (Distribution and Inventory Management). The most recent technological step is "Collaborative Commerce", which unifies all of the above mentioned elements into one coherent system within and between organizations.

(a) M.R.P.- Material Requirements Planning

However, by defining what M.R.P. is, companies and software vendors are able to adopt a standardized set of methods by which they can schedule delivery of raw materials against the manufacturing schedule, thus keeping their assembly lines moving while at the same time minimizing the amount of inventory on-hand.

M.R.P. began as a relatively simple, yet important analysis of manufacturing processes and production schedules, combined with bills of material and/or resources, to predict what the requirements would be for various components and/or manufacturing processes in order to meet the current master schedule. The systems merely perform an analysis of existing conditions, report back what the requirements are, and optionally recommend changes to existing purchase and production schedules to meet the requirements of the master schedule.

MATERIAL REQUIREMENTS PLANNING



Source: SAP

To assist planners in tracking some of the problems associated with inventory control, some kind of feedback loop is needed in the M.R.P. process. This is not only to automatically re-schedule certain items, and avoid excessive manual effort in controlling the process, but to detect and report performance that is out of spec (such as a vendor performance report to track on-time delivery performance). This feedback loop is the defining factor for an M.R.P. II system.

A further challenge is, to define a whole business M.R.P. process that goes beyond simple component/assembly relationships, that goes beyond resource requirements, and that goes beyond vendor performance and component shrink factors and safety stocks. The M.R.P. III process begins with an Accurate Demand Forecast that drives the remainder of the business. Using the best possible demand forecast, a Master Schedule is developed.

The M.R.P. III system derives the individual component and assembly requirements from the Master Schedule, and recommends new purchase orders. It also generates recommended purchase order reschedules, and automatically reschedules non-master scheduled assemblies based on the availability of components/resources and material requirements. The M.R.P. III system also monitors and reports vendor performance and plans performance by the assembly line.

(b) ERP- Enterprise Resource Planning

Enterprise Resource Planning, which came into its own in the early 90's, is typically comprised of three key high-level components: Manufacturing and Logistics, Finances and Accounting, and Human Resources and Payroll.

Enterprise resource planning software attempts to integrate all departments and functions across a company onto a single computer system that can serve all those different departments' particular needs.

It is a tall order building a single software program that serves the requirements in the finance department, just as well as it does the requirements of human resource issues and in the warehouse. Each of those departments typically has its own computer system; each optimized for the particular ways that the department does its work. ERP combines them all together into a single, integrated software program that runs off a single database so that the various departments can more easily share information and communicate with each other.

That integrated approach can have tremendous payback benefits if companies install the software correctly. Typically, for example, when a customer places an order, that order begins a mostly paper-based journey from in-basket to in-basket around the company, often being keyed and re-keyed into different departments' computer systems along the way. This causes delays and lost orders, and the keying and re-keying into different computer systems invites the possibility of errors. Meanwhile, no one in the company truly knows what the status of the order is at any given point because there is no way for the finance department, for example, to get into the warehouse's computer system to see whether the item has been shipped. How can ERP improve a company's business performance?

A Meta Group study of 63 companies found that it took eight months after the new system was installed (31 months in total) to see any benefits. However, the median annual savings from the new ERP system was US$ 1.6 million per year. ERP automates the tasks involved in performing a business process—such as order fulfillment, which involves taking an order from a customer, shipping it and billing for it. When a customer service representative takes an order from a customer, all the information necessary to complete the order is available through ERP (the customer's credit rating and order history, the company's inventory levels and the shipping dock's trucking schedule). Everyone in the company sees the same computer screen and has access to the single database that holds the customer's new order. When one department finishes with the order it is automatically routed via the ERP system to the next department. To find out where the order is at any point, it is only necessary to log into the ERP system and track it down. The order process moves through the organization in "real time", and customers get their orders faster and with fewer errors than ever before. ERP can apply that same mechanism to other major business processes, such as employee benefits or financial reporting.

(c) CRM-Customer Relationship Management

Over time, customer relationship management has evolved from disconnected Sales Force Automation software (SFA), into strategic e-business solutions that deliver integrated, consistent customer service. Businesses use CRM systems to provide customers uniform service and support quickly and easily. The best-in-class CRM solutions encompass all customer-facing front-end and enterprise-level back-office systems and processes —from the contact center that handles customer's orders to the inventory system, though tracking product availability to the warehouse, to fulfillment and order delivery. With CRM, for example, the supplier's production orders can instantly be updated as the company's sales increase. The supplier's production system immediately updates the receiving schedule. The finance system automatically collects and posts customer payments. CRM instantaneously communicates confirmation and delivery dates for customer orders via the Web.

CRM solutions that integrate customer relationships become strategic requirements for a customer orientated Digital Economy. Considering that it costs four to 10 times as much to attract one new customer as it does to retain a current one, CRM strategies that deliver consistent, superior service across all customer touch points are critical. Through individualized and personalized communication strategies on a large scale (mass customization), CRM strategies deliver personalized service to all customers. Strategic CRM solutions capture customer data from across the enterprise, consolidate all internally -and externally- acquired customer data in an integrated data repository, analyze that data, distribute the results of the analyses to various constituents of the extended enterprise, and use the information when communicating with customers. This can unlock the full potential value of the customer by optimizing the relationships between the enterprise and its business partners, while placing customers at the center of an enterprise's operations.

Customers gain convenience through 24x7 availability and consistent, multi-channel accessibility, easily navigated systems, seamless and accurate processes, and consistent service standards. Experience through interaction is relevant, because offers are aimed at specific customers, based on individual needs through a customized interface, and provide personalized content. Customers can require a variety of products, the ability to customize them, and even dynamic pricing. Customers can determine delivery methods on demand. However, secure transactions and data privacy must be ensured.

The most obvious benefits for the company come from potential increases in revenues and cost reduction. Manufacturing organizations report substantial savings on functions such as order processing after integrating sales and marketing operations with back-end order-entry systems and the Web. Lower acquisition costs,[26] remediation of unprofitable customers, automated interaction, increased productivity of field sales and service forces, reduced direct-marketing media costs, optimized inventories, and streamlined business processes all serve to reduce costs. Higher customer acquisition rates, efficient prospect tracking, improved direct-marketing response rates, greater sales revenue share and profitability with existing customers, all add up to increased revenues. Financial services companies have quickly attained huge returns on Internet-enabled CRM investments. Less tangible than increased revenues and decreased costs, but equally important are competitive advantages CRM systems deliver through enhanced customer service. Customer satisfaction translates into greater customer retention and loyalty. Richer customer and market insights facilitate the development of relevant products and move them to market faster.

(d) BI- Business Intelligence

Business intelligence software, a category that encompasses a wide range of tools and packaged systems, is designed to help companies ask

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[26] Lower acquisition costs are significant, as it is estimated that online customer acquisition costs range from about US$ 100 to more than US$ 200.

relevant questions of all data available, and to act on it. In principle it is based on current programs, like tracing lineage back to decision-support applications, executive information systems, and database reporting and querying tools.

Through the aggregation and interconnection of information from many sources, the very idea of analyzing data, in fact, may be changing. While today most intelligence is derived from studying what has already happened, BI products are forging ahead, alerting customers when certain key performance indicators are lagging, for example. The route that companies take towards greater intelligence can vary. There are a plethora of online analytical processing and data-mining tools that enable companies to create their own BI systems.

(e) SCM-Supply Chain Management

Supply Chain Management is a broad term, embracing everything from supply chain planning (SCP) to supply chain execution (SCE) software.

SCP software products support strategic and tactical planning that look into the future and deal with supply, distribution and manufacturing planning, production scheduling, demand planning and forecasting, supply chain collaboration and supply chain network design. SCE applications use the information generated by SCP tools to guide the physical production, storage and movement of raw materials, assembly components and completed products. These systems are able to interface with SCP and other management systems to determine production capacity, including cost or time constrained, and calculate a production plan which satisfies all requirements and can adapt quickly to any change in variables. Typical applications are order management, inventory management, warehouse management, transport management and logistics. These execution programs therefore track the physical status of goods, the management of materials, and financial information involving all parties.

Supply chain systems not only need to communicate with one another, but they need to integrate essential trading partner business practice knowledge into each trading company's business logic. Nowadays, trading partners still cannot share business practice knowledge or content across the supply chain by simply clicking on the "send" button. Not only is the lack of standardized technology an impediment, the data itself can be an obstacle. When data is confidential, transmission requires a very secure data communications connection. If the data is volatile or a database is too large to transmit, continual, real-time access may not be feasible. Companies focus on how to integrate their trading partners' business practice knowledge into their own business applications quickly and painlessly.

Adding to the complexity of inter-company business process synchronization is the accelerated adoption of technology. New technologies are changing the way companies do business everyday and accelerating business process synchronization. Technology is not just advancing business process synchronization; it is constantly changing it, making it difficult and expensive for companies to keep pace. The change in technology is forcing vendors to constantly keep pace with the rest of the market.

Electronic business behavior is transforming the way companies manage their distribution systems. This is placing a greater emphasis on the way companies handle their supply chains. With "time to market" being the cornerstone of success, manufacturers increasingly work in collaboration with suppliers to fulfil demand, similarly to how they need to work with retailers to predict demand. As more companies start to trade online, optimization issues become more complex, with distance and transport costs playing an increasingly important role.

Web-based SCE systems, designed to take advantage of the latest technology, are the result of protracted, expensive development efforts by vendors. To build the programs, vendors can often spend 30%-50% of their annual revenue over 2-3 years on research and development (R&D). The transition to Web-based systems represents a huge gamble for vendors, particularly if they are publicly traded. For the vendor, Web-based systems represent a true commitment to Web technologies, moving the user into an entirely different set of supply chain capabilities. Web-based systems are designed to support the newer communication standards like Extensible Markup Language (XML), which makes integration much more efficient than through flat-file or EDI (Electronic Data Interchange) transactions. Web-based systems do not negate the commitment a company has made in EDI. EDI has been the traditional data exchange methodology in the past, composed of proprietary systems that connect to omnipresent mainframe systems.

Large corporations and SMEs still rely heavily on EDI to transmit and receive order requests along the supply chain. For large-scale players who implemented EDI early on, it will continue to be a major medium for the flow of information. These organizations have typically invested millions of dollars into these networks and are unwilling to abandon them for Internet technologies that, in their view, still have to be proven. However, Internet technologies such as Java and the Extensible Mark-up Language, are nevertheless playing a larger role in developing systems to exchange information among companies along supply chains. Part of the reluctance to move SCM online is also linked with the fact that many large corporate supply chains include smaller companies who refuse to replace their legacy EDI with Internet-based equipment.

Typically, supply chain management re-engineering involves external customers and/or suppliers. If it does not, it is just an internal project masquerading as supply chain re-engineering. A huge challenge exists within the integration of the customers and suppliers into the re-engineering project. Issues include the fear to loose competitive information, working with different cultures based on past relationships, coordinating resources across multiple companies, establishing trust in how benefits will be realized, sharing funding, determining project leaders and resources.

The diversity of information types, sources and technology systems begets the Internet as a fundamental building block in communication infrastructures. Companies must work at "real time" to keep pace with the demands of consumers that are far more educated and demanding than ever before, given the quick and easy access to information over the Internet. Convenience and speed become the normal requirements and this is not just in the business-to-consumer (B2C) marketplace. As companies are realizing the substantial return on investment that can be gained through business to business (B2B) integration efforts like supply chain automation, suppliers and trading partners are demanding the same fast, easy access to information that is afforded to end customers. In order to achieve the high levels of collaboration required to synchronize the supply chain, companies must balance the needs of consumers with those of suppliers and partners. This includes offering suppliers and partners the same communication vehicles as consumers. But whether using B2C or B2B, the access and transfer of information over the Internet raises issues of security. While a synchronized supply chain requires trust and collaboration, it also demands proper access control and security measures to safeguard proprietary information. This is particularly critical in supply chain communications where the content may pertain to planning, transactions or other strategic business activities. These issues currently act as a major challenge for vendors in the marketplace.

(f) e-Marketplaces and Collaborative processes

The evolution and integration of the collaborative processes through the currently most important business applications (as described above: ERP, CRM, BI and SCM) are evolving into powerful "e-Marketplaces", which are based on the premise to replicate (and not create) industry activities in an online environment. These kinds of eMarketplaces constitute the integral link between the Generic Service Layer and the e-business sector. They connect the business applications of the different information systems in order to coordinate communication between the individual entities.

E-BUSINESS APPLICATIONS IN LATIN AMERICA

Advanced e-business software systems are still very expensive and while large enterprises in Latin America already reach a penetration of 5%-11% in ERP (Enterprise Resource Planning) or CRM (Customer Relationship Management) systems, less than 1.0% of the region's SMEs operate with such sophisticated systems. In comparison to other developing regions of the world, Latin America is not too far behind in software implementation. It is estimated that 4.0% of South American and 3.0% of Central American companies had some kind of e-procurement system (SCM) implemented in 2001. While in the United States 40% of the companies have done so, in Europe only 10% of the firms participated in an e-procurement supply chain and in Asia only 3.0% of the companies (eMarketer, 2002).

Source: Martin R. Hilbert based on eMarketer, Latin America Online: Demographics, Usage & e-Commerce, October (http://www.emarketer.com;http://www.emarketer.com/products/report.php?latin_am), 2002.

The range and complexity of eMarketplace activities are potentially enormous. However, in the interests of brevity, eMarketplaces may be primarily differentiated across four criteria: (1) participant focus; (2) public/private; (3) revenue/IT investment; (4) breadth of service.

Participant focus can be focused on a region or a specific industry. In order to gain critical mass, eMarketplaces can focus their attentions on regional markets. Regional eMarketplaces are necessarily industry-independent. Thus, the types of goods and services which are traded in regional eMarketplaces tend to be non-production-related, e.g. computer equipment, stationery. Non-production (or indirect) goods provide an opportunity which has been targeted so effectively by Commerce One and Ariba. Industry specific eMarketplaces aim to unite participants in a specific supply chain, e.g. steel, plastics, chemicals, oil or automotive. These eMarketplaces focus more on the trading of direct goods, some of which are commodities and some of which tend toward the more complex purchase type.

eMarketplaces, in particular vertical eMarketplaces, may be segmented into two groups: private and public. Private eMarketplaces include consortia of industry leaders such as Covisint in the automotive sector. Public eMarketplaces, which are truly open to all traders, include independent eMarketplaces with no sunk equity investment by participants such as eSteel and PaperEx.

It is a common misconception that all eMarketplaces are designed as independent revenue-generating business entities. While this is true of most, it is increasingly likely that large enterprises will seek to establish eMarketplaces dedicated to their own supply chains. For example, a large food retailer may wish to create an Internet-based collaborative and trading platform exclusively for its own suppliers. In this case, it may view its eMarketplace more as a managed IT cost (leading to cost savings) rather than a source of revenue generation in its own right.

eMarketplaces may also be differentiated by the breadth and complexity of the services they offer. Some eMarketplaces currently offer little more than basic business matching, content and directory services. Some have begun to transact business, either through contracted buying or free auctions (many use transaction type as a way of defining eMarketplaces, although in truth this is merely a reflection of industry pricing dynamics). Others are beginning to sign up the necessary financial partners to offer end-to-end transaction cycles —such as banks, legal services and insurance companies. Others are focusing on IT, using their platforms to offer application access. The market is currently immature and not every eMarketplace will make the transition from basic to complex services. The market for broad eMarketplace platforms will consolidate, while the opportunities for niche service plays will proliferate.

Modern Information and Communication Technologies are transforming the way in which the world conducts business. The Digital Economy is redesigning, automating and integrating all business operations from demand capture, production planning, purchasing to delivery. Demand and supply get networked, digitizing Walras's Law of Markets[27] (Walras, 1874). The process Walras described as "tatonnement" or "groping", emphasizing that equilibrium prices and quantities were established through repeated experiments, is accelerating tremendously. From electronic scanners at cash register to the raw material production data about the demand and supply are put "online". In theory, in a competitive digitized market, supply and demand should reach a parteo-optimal state in "real-time". The ubiquitous nature and low cost of this global communications network has enabled new processes, commerce activities, and business models. However, the Internet has also given birth to greater customer expectation, increased pricing and cycle time pressures as well as intensified competition. To

[27] Walras Law states that the sum of excess demands over all the markets in the economy must equal zero and that this applies whether or not all markets are in general equilibrium.

remain competitive in this marketplace, companies need to identify new strategies to continually reduce costs, improve productivity, and enhance responsiveness.

2. Software implementation in companies [28]

This section provides a brief overview of the process whereby companies adopt information management technologies. This analysis reflects the fact that companies' choice of information management systems goes beyond a technological problem and becomes a strategic factor when it comes to deciding what to incorporate and how to do so. This process must consider multiple factors. These arise from the specifications of the software solution (harmonization with business processes, etc.), the firm's internal conditions (organizational culture, etc.), the structure of the market in which the firm operates, and external conditions (regulatory environment, etc.) (see figure "Spheres of influence").

Advancing in this direction involves many players, some of them from outside the firm itself, and requires cultural changes inside companies, in external factors and in government policy. The best way to start is by educating companies and providing an incentives regime so that they move forward with the digitization of their own operations. Education does not refer solely to companies training their staff in the use of ICT tools, but also extends to teaching them about the range of tools available, together with their advantages and disadvantages.

Another important factor in companies' assimilation of information technologies is the cost involved in implementing these solutions, which in many cases is more than the technology itself.

For some organizations the benefits of implementing an ICT system are not clear. This may be due to company size, among other factors. A large company not only has the resources to incorporate ICT systems but also the skilled staff who understand their advantages. Many companies know or at least have some idea that they should include ICT systems. Others, in contrast, still wonder if the benefits will be worth the high investment in this kind of solution and they may conclude that it is better to invest in new machinery and infrastructure, rather than "spending on computers".

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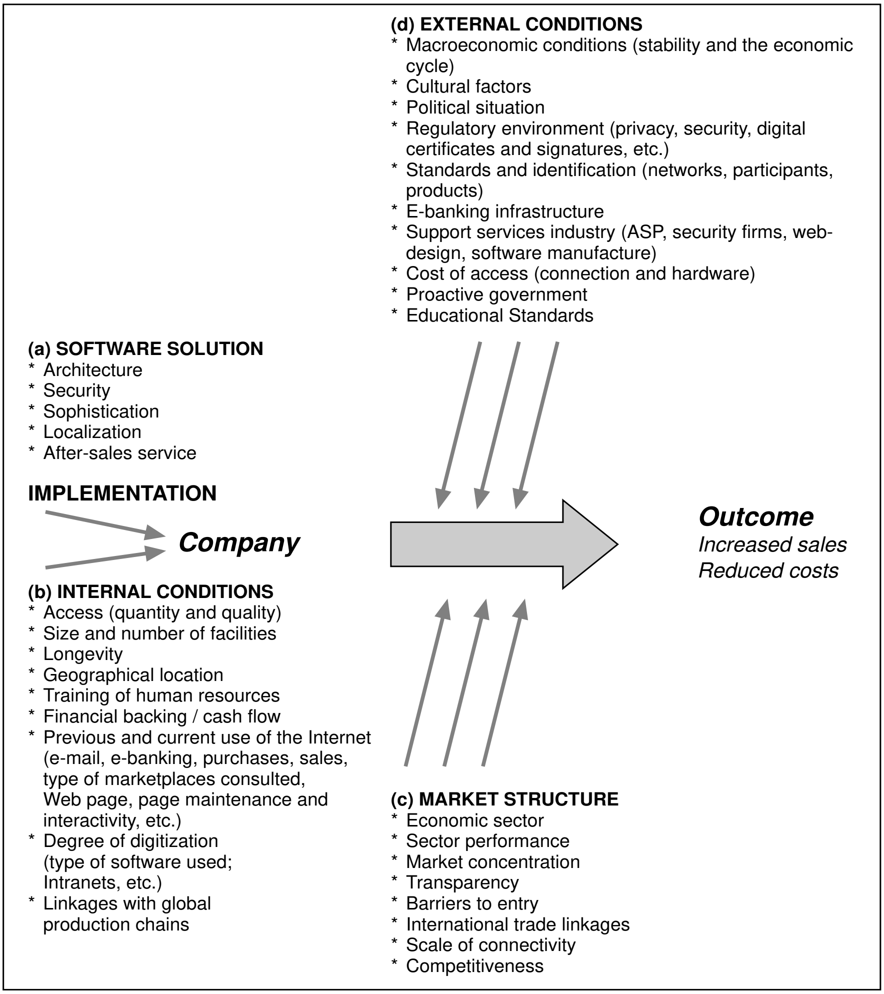
[28] This Section was contributed by Alejandro Arancibia, Account Manager, Soluciones Expertas S.A., Chile

One factor that influences these attitudes is the average level of education and ICT-awareness within the company. There is also the prejudice that ICT solutions involve heavy investment. This is true in some cases, but there are lower cost alternatives that can make their use easier for companies. Many information systems on the market, particularly those classified as world-class, incorporate best business practices in each department, and although they have been built to be highly parametrizable, attention must be paid to the company's own organizational culture. By and large, the greater the attempt to adapt a system to a company's operating procedures, the more complex the project will become, the longer the implementation time, and the greater the risks incurred. It is necessary to exercise caution when customizing an information system, since the system may well be forced to do something for which it was not designed.

The benefits provided by the system should be compared to the benefits expected by the company. When the time comes to choose an information system, it is essential that the search for solutions is based on clearly defined priorities. When companies make the decision to implement information systems, they need to bear in mind what changes, large and small, will be required of the organization and its environment. These changes will in essence reflect the adoption of procedures and processes required at both the information system and organizational levels, in order for both to work together satisfactorily.

The implementation process should include: (a) an evaluation of alternative solutions; (b) several internal factors relating to the company; (c) other factors related to the structure of the market in which the company operates; and lastly (d) external factors, those related to the particular features of the country and the region.

SPHERES OF INFLUENCE



Source: Martin R. Hilbert, «Electronic Supply Chain Management for manufacturing SMEs in the Mercosur» Vienna, United Nations Industrial Development Programme (UNIDO) in cooperation with the Economic Commission for Latin America and the Caribbean, UN (ECLAC), unpublished, 2002.

(a) Software solution

The technology used by information systems is a key factor in the technical evaluation process. Questions that should be answered include: Is this the right time to change over the platforms that support information in the company? Open or closed architecture? What information security features are provided? Do the solutions being evaluated fit in with the company's technology policies?

One important factor is system “localization”, which means that the software has been adapted to the specific characteristics of the country or region. The language used must be that of the country or at least the region, for example, Latin American Spanish or Portuguese. The software must conform to the policies and legal framework of the region or country (for example, the tax system), or must have the necessary parameterizations to implement them.

The software evaluation must also take into consideration hardware requirements (servers, terminals, printers, etc.). The after-sales service offered by the company or its agents is an important consideration.

(b) Internal conditions

For an information system to be considered during evaluation, it must comply with the key functions required by the organization at the very least. The system is being evaluated to see whether it has what the organization requires. Moreover, the software provider or its agents must put together the implementation and support team. During this stage of the process, it is important to consider the professional profile of the consultants who will be involved in implementation, and the degree of affinity with, and knowledge of, the business. The capacity and availability of post-implementation technical support and the cost of this support are critical factors.

(c) Market structure

The special features of each individual market are a key consideration. The market structure of manufacturing differs from that of commerce. This has implications for the software solution that the company intends to apply.

(d) External conditions

Lastly, attention needs to be paid to macroeconomic conditions and the political situation prevailing in the country, as well as the legal context in which the company operates. The infrastructure and costs of telecommunications in the country also have a bearing on any final decision regarding ICT solutions.

Implementation requires a commitment from both the solution provider and the company purchasing it. All the expense and effort put into evaluating the different options will be in vain if implementation is not carried out effectively, with a high degree of commitment and clearly defined objectives. It requires flexible project implementation teams on the part of both provider and buyer, with the ability and the authority to make decisions during the project. If decision-making during implementation is slow, delays will result. The final stage involves several activities to consolidate use of the system by the company (for example, the formation of a team responsible for system continuity, operations and upgrading).

In short, building a digital community requires specific policies that facilitate this process, and the changes necessary to complete this task must be made by governmental bodies and private business alike. In other words, technology alone cannot drive progress towards a digital community. Technology is the tool that allows goals to be met, but clear and precise objectives, combined with governments and institutions that facilitate their implementation, are also necessary.

The cost of access to information systems and the associated operating platform must be within the reach of firms of all different sizes. In this regard, government initiatives to encourage the adoption of information systems take on importance. Incentives are needed that accelerate the take-up of information systems, given that up-front costs often exceed the benefits in the short term, especially for small businesses. Governments must come up with some creative schemes to encourage companies to install information systems. They could, for instance, offer tax concessions to companies that implement such systems. This kind of initiative should also consider the components required to get systems up and running, including at least the cost of hardware, software, implementation services, communications, training, etc. Widespread use of digital transactions in government agencies can act as a further incentive. For example, public sector demand generated through a B2G site may encourage companies to migrate towards e-commerce practices.

When they adopt information technologies, companies must consider internal and external factors, as well as those relating to the particular market, and they need to be educated and/or trained so that they have the necessary skills in-house to embark on this kind of project. Some key considerations include:

- Alignment with corporate goals: The software must match the company's objectives. It is important to visualize the benefits accruing to the company (which are not necessarily financial in nature) and compare them with the results. In this context, it is useful to establish some benchmarks.
- Organizational motivation and the dynamics of change: It is important to involve different company players who perceive

this process as something that will help them and allow them to grow professionally. The company must also be prepared to make changes along these lines.

- Even if users are otherwise willing to carry out transactions on the network, efforts in this sense will be in vain if no acceptable means of payment is available. Often services are available but go unused for fear of mistakes in processes or security. Steps must be taken to ensure that information is secure and confidential.

- Speedy amendments to the laws that facilitate the use of technology for the digitization of information is another key factor, decisive to the pace of software system implementation.

- Lastly, it is important not to underestimate the effort and cost involved in maintaining and modernizing information systems over time. This also represents a cost for businesses, and in some cases quite a hefty one. Obviously, systems are not static and if they are not maintained, companies will eventually find themselves back at square one due to obsolescence.

3. Software as a service: Application Service Providers (ASP) [29]

The costs associated with hardware and software are out of reach for many firms, particularly those classified as small and medium-sized (SMEs). Application service providers, or ASPs have become a promising alternative in these cases. ASPs offer several advantages to those who can't make a heavy investment in ICT. The supply has proliferated worldwide and become increasingly available in Latin America, offering solutions not only in the business sector, but also in electronic government (especially at the municipal or city level), health care (hospitals), research centers, and so on. This chapter provides a general overview of the market in business applications software and the trends that influence the development of this new option for gaining access to technology.

(a) Market trends

A few years back, the dilemma was "to develop or to buy". Today it has become clear that developing software in-house is only justifiable in

[29] This Section was contributed by Glen Canessa, Business Technologies Consultant, Novis S.A., Chile

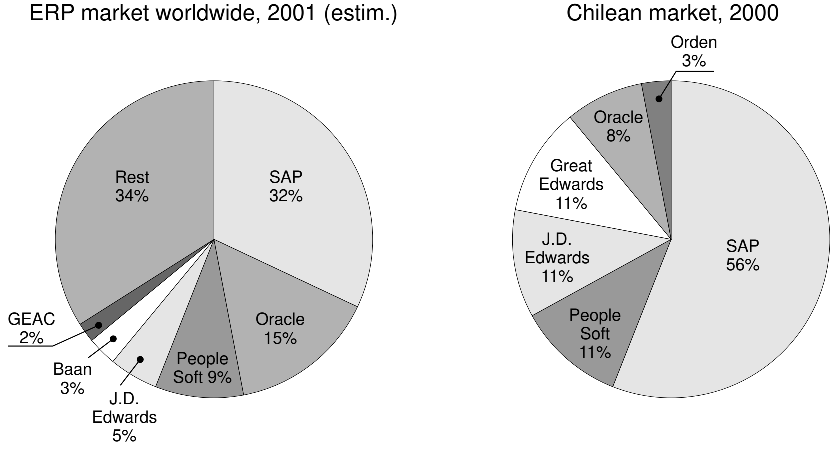
the case of large companies or those with very specific functional needs, which cannot find the right solutions in the marketplace.

Typically firms that at some time opted to develop their own software have had to replace it with new and different systems. The reason for the replacement is not that companies' own proprietary systems lack functionality, but rather because of the problems associated with maintaining a single product, with an acceptable level of quality, at an accessible cost. Companies that have not had the means or opportunity to replace their proprietary systems regularly report problems such as technological obsolescence, poor capacity to incorporate new functionalities, long response times in meeting user requirements, and poor capacity to integrate new technologies (Windows, Office, the Internet, etc.). The new dilemma, therefore, seems to be "to buy or to lease".

Increasingly, leading software providers see a future in which software is no longer sold as a license "in perpetuity", but rather as a subscription to a service. Under this model (the ASP model), a local services company purchases a world-class software solution (for example for Enterprise Resource Planning, known as ERP) and makes the use of this application available to a number of other local companies. Thanks to economies of scale and the sharing of fixed costs, the costs to the individual firm are reduced. This approach is based on the rapid pace of innovation demanded by the software industry, due to changes in the business environment and the enormous complexity of the product, which requires constant upgrading under the direct supervision of the manufacturer. The processes involved in upgrading from the plant to the customer, with the accompanying requirements for training and technical support, are becoming increasingly unviable, especially for companies that lead technological development in this field. With ASP, the customer generally runs the new software on existing hardware, and acquires no data base, communications system, or backup system, since in the case of failure, the ASP provides all the services associated with data security, backups, hardware or software replacement (Arancibia, 2001). Under this system, the company's investment is reduced to a monthly payment for system use, which rises as the company adds more users.

The most often mentioned disadvantage of the ASP system is that the software must be used in a completely standardized format, meaning there is no alternative for customizing the software to the customer's own particular operations, because it is rented from a central server. However, today there is clear evidence of a consolidation of the supply of ERP systems. The figure below estimates market share for this year, at the global level. The four main providers hold more than 60% of the market, and more than half are large-scale providers. This situation is even clearer for developing countries in Latin America, as the figures for Chile show.

CONSOLIDATION IN SOFTWARE MARKETS



Source: TEC (Technology Evaluation.Com), «TEC's Research Library» http://researchlibrary.technologyevaluation.com/data/rlist?t+busofit_10_52), 2001; IDC (International Data Cooperation), «eWorld 2001» (http://www.idc.com), 2001

This consolidation of software markets, especially in Latin America, reveals that individual software does not play a very important role at present. There are many companies in Latin America that, due to the size of their operations, can adapt to a software operating system.

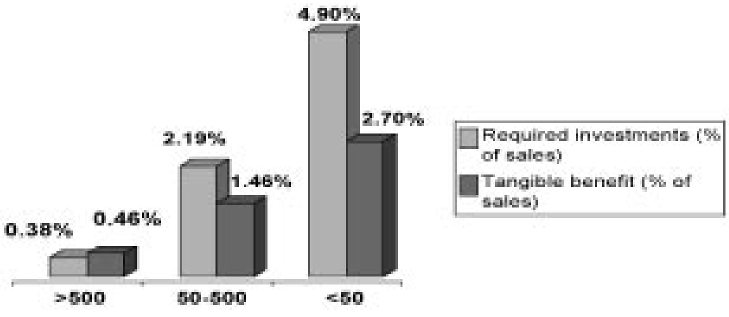
The segment with the largest share of the business software outsourcing market is SMEs (small and medium-sized enterprises). Studies show strong growth in the ICT outsourcing market, with around 90% posted by companies with fewer than 1,000 employees[30] (Forrester Research, 2001).

(b) Costs and benefits

The rationale behind Application Service Provision (ASP) is based on analysis of the typical costs and benefits of ERP projects implemented in companies. The following table sets out the relationship between costs and benefits, as a portion of company sales, in projects of various sizes in companies operating in the Mercosur.

[30] It is necessary to point out that in most Latin American statistics, firms with 500 employees are classified in the large company segment.

ERP COSTS AND BENEFITS BY SIZE (ANNUAL SALES, MERCOSUR COMPANIES)

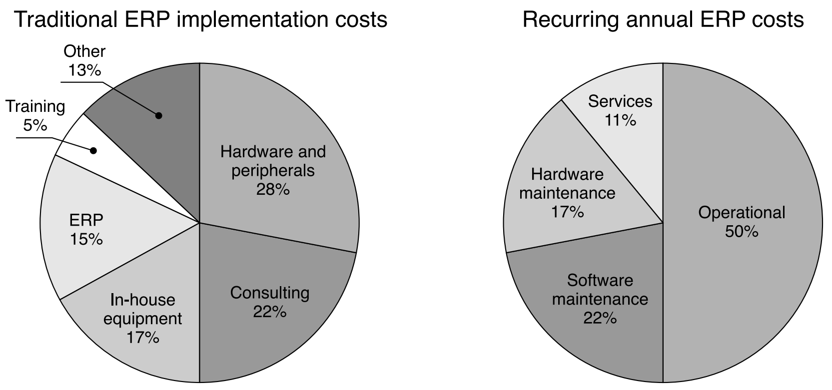


Source: Symnetics, "Beneficios de Systemas ERP en Mercosur". (http://www.symnetics.com.br), 2001

The studies show how the smaller the size of the company the greater the investment involved, comparatively speaking. Although tangible benefits also increase in relative terms, the smaller the company, the less favourable is the cost-benefit ratio.

The figures below provide a typical breakdown of ERP project costs, supporting arguments in favour of the ASP model.

TOTAL COST OF AN ERP SYSTEM (MERCOSUR COMPANIES)



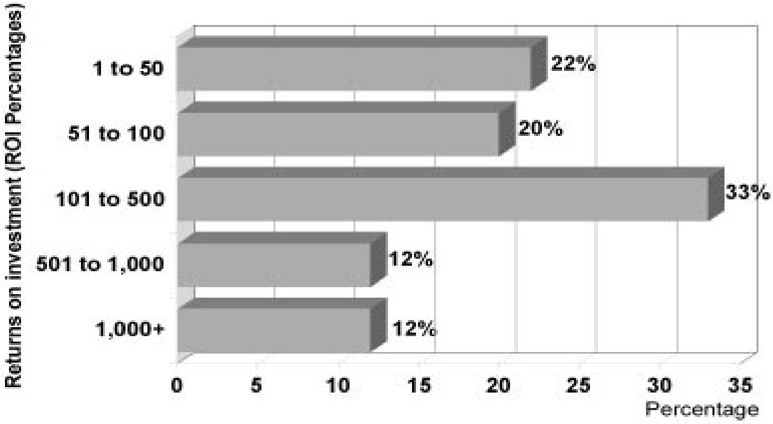
Source: Symnetics, "Beneficios de Systemas ERP en Mercosur". (http://www.symnetics.com.br), 2001

The main investment costs are in infrastructure, which accounts for 47% (hardware and peripherals, ERP and databases, development), and implementation, which makes up 44% (consulting, in-house equipment, training). The use of shared infrastructure by means of an ASP service permits saving on infrastructure components. In addition, preconfigured solutions and accelerated methodologies are designed to reduce installation costs. Among recurring costs, operations represent the largest item. With its shared infrastructure as well as shared service organization, the ASP may greatly reduce the cost of this item. The costs of hardware and software maintenance will decrease in proportion to the costs of purchasing them, to the extent that the ASP manages to secure special pricing and licensing agreements with its suppliers, which normally operate as business partners.

The ASP model provides a number of benefits to businesses. Some of these benefits are characteristic of any initiative to partly or fully outsource processes. The ASP model involves all such advantages, and provides some additional ones. For instance, the ASP model minimizes investment and frees up ICT resources used in managing infrastructure. The service normally includes all the necessary components for a single monthly fee. Also minimized are the costs of administering a secure infrastructure and high-quality applications. The service frees the company from the need to hire, train and retain a staff of managers and operators of servers, databases, applications, networks, etc. The cost structure is optimized, the company paying only for what it uses. The customer may increase or decrease the number of users, and with it the monthly fee, according to its requirements. Such optimization is impossible when the customer acquires software licences and its own infrastructure. The service often comes with guarantees regarding availability and response times. It is the ASP's responsibility to have available the hardware, software and communications resources necessary to maintain the standard agreed to in the contract. Moreover, the company no longer has to manage a range of contracts with different providers (server maintenance, networks, Internet access, software, etc.) The ASP is responsible for running and maintaining infrastructure, while the company has a single contract with its ASP. The company may expand or reduce its requirements (number of users, volume of data, etc.) with much greater flexibility than if it had its own facilities.

One of the most obvious benefits is the rapid uptake of state-of-the-art technologies for business processes. The firm can take advantage of cutting-edge technologies supporting company procedures that were previously accessible only to large enterprises. This helps the firm to deal with the problem of technological obsolescence of ICT infrastructure, thereby boosting its efficiency and competitiveness. In practical terms, the benefits should be reflected in returns and profitability, thus increasing company efficiency and competitiveness. The figure below sets out the results of a recent study conducted by IDC into the returns on investment (ROI) of ASP projects.

RETURNS ON INVESTMENT (ROI) FOR ASP SERVICES —AS PERCENTAGE OF COMPANY SAMPLE



Note: Sample of 50 companies.

Source: IDC (International Data Corporation), «eWorld 2001» (http://www.idc.com), 2001

Lastly, it should be emphasized that apart from benefiting the companies that use the software through the ASP model, a local services industry is in the process of being created. This industry may avail itself of world-class applications produced by transnational software companies, however the added value of the service is produced locally, which opens up employment opportunities in a profitable and advanced service sector.

Chapter III

Diagonal areas in Latin America and the Caribbean

A. Regulatory framework

Information and Communication Technology systems develop very fast. In the Infrastructure and Generic Service Layers, the dynamics of ICT-convergence accelerate the forces of the Schumpeterian "creative destruction", while digitization in the "e-Sectors" brings about profound institutional changes in social and productive organization. The development and maintenance of a regulatory framework which reduces the risks and uncertainties that characterize the transition towards an Information Society and which accelerates the adoption of the new paradigm, becomes indispensable.

This Section analyzes three different aspects with regard to the Regulatory Framework of an Information Society. The first section examines the regulation of the telecommunications industry, as one of the industries of the Horizontal Layers. Aside from the telecommunications industry, the hardware and software industries could also be subjected to this kind of policy analysis, but due to the scope of this book these industries are not dealt with here. The second Section examines the judicial framework, which is necessary to enable the growth of digital activities in the different "e-Sectors" of the Information Society. Besides the necessary adjustments of the regulatory framework of the Horizontal Layers (market regulation) and Vertical Sectors (juridical adjustments), the Information Society also raises a series of questions about the provision of basic rights. The often-cited "right to information and communication" and other principles that underlie universal human rights are part of this discussion. The importance of information in the Information Society and new ways of handling information through digital networks also require a special focus on the question "how information can be owned". The third section of this Section gives a short overview of some of the issues involved in the omnipresent discussion about intellectual property in an Information Society.

1. Telecommunications regulation

Incentive regulation and competition are being introduced worldwide in the telecommunications, electricity, gas, postal and railroads services, amongst others. The telecommunications industry has been at the forefront of incentive regulation reform and Latin America and the Caribbean have led telecommunications privatization. As a result, almost every country in the region has an entity that regulates the telecommunication industry.[1] Today they face the challenge of regulating the telecommunications sector in Latin America and the Caribbean and to assure its growth and development.

(a) Privatization, Competition and Incentive Regulation

No other region has embraced the privatization of telecommunications as enthusiastically as Latin America and the Caribbean. In 1988, Chile became the first country to sell its state-owned telecommunications company.[2] Today, 74% of the region's main telecommunications operators are either completely or majority-owned by private (often foreign) investors, making the Americas the region with the most privatized telecommunications sectors in the world.[3]

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1 CNC in Argentina, SITTEL in Bolivia, ANATEL in Brazil, SUBTEL in Chile, CRT in Colombia, ARESEP in Costa Rica, INDOTEL in the Dominican Republic, CONATEL in Ecuador, SIGET in El Salvador, SIT in Guatemala, CONATEL in Honduras, COFETEL in Mexico, TELCOR in Nicaragua, ENTEREGULADOR in Panama, CONATEL in Paraguay, OSPITEL in Peru, CONATEL in Venezuela, between others.

2 Country and year of first privatization of telecommunications: Chile 1988, Belize 1988, Mexico 1990, Argentina 1990, Guyana 1991, Venezuela 1991, Peru 1994, Panama 1997, Brazil 1998, Guatemala 1998.

3 In Europe 63% of countries had privatized by 2001; Asia-Pacific 53%; Africa 35%; Arab States 29%.

PRIVATIZATION AND LIBERALIZATION IN THE TELECOM SECTOR

Liberalization of telecommunications has occurred separately from privatization in many Latin American and Caribbean economies. Every country has pursued a different model for privatization and liberalization. Colombia, for example, followed the North American model to promote a duopoly per geographic region. In other countries, such as Chile and Mexico, the new operators have had to compete nationally with each other and with older operators. It turned out that in this model it is difficult to break the de facto monopoly of the former state-owned operator. Venezuela would be an example of a country taking a mixed approach, introducing a duopoly on a national scale. Brazil is the last model, with competition between operators taking place solely in local segments (Ahciet, 2002).

Source: Martin R. Hilbert

The primary focus of underlying privatization policies may not have been an attempt to increase competition. Accumulating and maximizing direct foreign investment, access to international financial markets (Argentina) or protecting an important national operator (Mexico) have characterized telecom privatization in the region (ECLAC, 2001a). National governments throughout the region have collected more than US$ 40 billion by privatizing formerly public, fixed-line, and telecom operators. Another US$ 10 billion has been collected by handing out licenses for mobile services to private mobile operators. During the first phase of privatization, little attention was paid to creating a suitable regulatory framework for the sector. Regulatory agencies were often created at a late date, and lacked the appropriate level of independence, resources, institutional powers and operational capacity (ECLAC, 2000b).

As a result, in many cases private monopolies replaced state-owned monopolies. Despite these common criticisms of telecom privatization in Latin America and the Caribbean, Latin America moved much more quickly toward liberalization than many developed countries. Unlike many developed countries, Latin America and the Caribbean did not wait until a high telecom penetration had been reached before starting liberalization. With fixed-line penetration under 30% in most countries, telecom markets in Latin America and the Caribbean have already been opened up for competition. The low profitability for operators in competitive markets in low-income countries sometimes makes it difficult for operators to justify further investment in markets that are expanding into the poorest (and therefore less profitable) segments of society (especially in regions with such highly skewed income distribution as in Latin America). Given these and other similar problems, the comparatively early privatization and liberalization processes that occurred in some countries have not been adopted by others. In Costa Rica, Honduras, Nicaragua and Ecuador, the initial privatization of operators has been suspended because of political opposition. In Uruguay, the opposition required a national plebiscite to be carried out before approving telecoms and other privatizations, thus effectively cancelling privatization initiatives (AHCIET, 2002).

However, despite present market deregulation efforts, most of Latin America's telecommunications industry still shows a rather low degree of competition in the fixed-line segment. As with most countries worldwide, competion is greater in the mobile segment and even more so in the Internet segment (ECLAC, 2001a). This order of things seems to have inherited some of the structure stemming from the days of national public telecommunication monopolies and secondly from entry barriers for infrastructure investments and accumulated knowledge about the business model in the different segments. As time progresses it seems to balance out and ICT-convergence makes the different segments interact.

Telecom regulators and analysts are working hard on creating different incentive schemes to reform telecommunications sectors. While the scope of this book does not permit more detailed exploration of this complex field, some general points may be made to highlight the main issues that follow.

To start with, it is important to underline that an incentive regulation regime is highly country specific. There is no "one-size-fits-all" recipe. This truism can go as far as supporting a telecommunications monopoly as the best policy, if the specific characteristics of an economy favour it. Some small countries, such as Uruguay and Costa Rica, have positive experiences with their public monopoly telecommunications operator in the fixed-line segment. Both countries reached very high fixed-line penetrations (28% and 25%, respectively in 2000), which presents Latin America's most advanced fixed-line network coverage (Katz J., 2000).

Furthermore, successful regulation needs to consider that the telecoms industry structure is evolving rapidly. ICT-convergence is creating a competitive scenario, in which service substitution and the entrance of new competitors plays an essential role. Public switched telephone operators, cable TV companies, mobile operators, fixed wireless operators, fibre-optic cable companies, and local area network providers are interacting in an increasingly competitive telecommunications market. Also traditional infrastructure owners (such as electricity, gas, water and railroad companies) who can lay telecommunications cables along their networks or even substitute traditional services (e.g. power line), are preparing themselves to enter the dynamic market (Laffont and Tirole, 1998). The speed of technical change in the telecommunications industry forces regulation to focus on regulating services, rather than technologies.

One of the main tasks of telecommunications regulation is to provide universal service. This includes policies that aim to extend telecommunications networks to remote rural and unprofitable areas and to provide public access to individuals who cannot afford personal telecommunications access. The concepts of universal telecommunication services vary between countries in the region and several models exist to finance such universal service provision. Subsidy mechanisms between different socio-economic groups, geographic regions, different types of services or a mix of them is one source of financing. However, granting subsidies has proved difficult in many cases. Many national regulatory authorities set up special funds, which are maintained through a specific percentage charged against the income of telecom operators (usually operators are obliged to contribute 1.0% of their gross income to the fund) or through other revenue received by the regulatory authority (e.g. licensing fees, etc.). With the help of these funds, neglected areas and communities are connected to the basic telephone network. Recently, some projects have been started to set up public Internet access points (so-called "info-centres") with the help of such funds.

In telecom regulation, the basic trade-off between competitive markets and income generation for individual companies also needs to be considered. As basic as this general wisdom appears to be, it is often neglected. While revenues per telephone mainline in more developed countries are well over US$ 1,000,[4] revenues in Latin America and Caribbean countries are as low as US$ 400.[5] Intense competition in domestic markets often pushes operators' revenues even lower. In addition, telecommunication companies in Latin America and the Caribbean are mostly owned by large transnational companies and therefore depend on decisions made in Europe or the United States, for example. Low income for domestic operators often results in the transnational company's central management refusing to undertake further investments in their small subdivision in Latin America and the Caribbean. This can slow down the updating of telecommunications infrastructure. However, a highly competitive market can force operators to update their infrastructure, in order to hold on to their competitive advantage. Finding the exact degree of competitiveness that allows the operator, on one hand, to make decent enough profits to justify further investments, and on the other, to guarantee low prices and high quality service, may be the most difficult task for telecommunications regulation.

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4 Revenue per telephone mainline 2000: Australia US$ 1,458; Finland US$ 1,406; Germany US$ 1,012; Italy US$ 1,247; Japan: US$ 1,541; Korea Rep US$ 941; Netherlands US$ 1,130; Portugal US$ 1,155; Spain US$ 1,528; Sweden US$ 1,205; United Kingdom US$ 1,508; United States US$ 1,466 (ITU, 2001).

5 Revenue per telephone mainline 2000: Bolivia US$ 826; Brazil US$ 823; Chile US$ 754; Colombia US$ 378; Ecuador US$ 400; Guatemala US$ 411; Paraguay US$ 685; Peru US$ 850; Mexico US$ 1,065; Venezuela US$ 1,385 (ITU, 2000a).

Last but not least, maintaining independence of the telecommunications regulator needs to be assured. This issue is gaining importance in Latin America and the Caribbean, where it has been realized that interdependency among different entities disrupts the normal functioning of each one. The frequent exchange of human resources between the private sector and public regulators, as well as unsure political guidance are two common causes of this interdependency. Due to high, fixed costs in the telecommunications industry, long-term returns on investment business models require stable and trustworthy regulation, which should not completely change its policy direction with each new government in power.

Closely linked to the independence of the regulator is the need for a controlling counterpart for the regulator. The Chilean experience shows that the existence of an anti-trust or competition watchdog, in addition to the telecom regulator, creates a positive dynamic between the regulatory agency and the general commission set up to ensure competition (Hilbert and Petrazzini, 2001). However, the lack of (or at least the unsatisfactory performance of) such an anti-trust institution in many Latin American and Caribbean countries creates an institutional vacuum in telecommunications regulation.

Summing up, regulating telecommunications is one of the most challenging tasks in building an Information Society and undoubtedly a powerful tool to narrow the digital divide. Telecommunications regulators all over the region require special attention. Aside from existing forums in ITU and CITEL, the recent creation of the forum "Regulatel" (*Foro Latinoamericano de Entes Reguladores de Telecomunicaciones*),[6] which by 2002 had brought together 19 telecommunications regulators from the region, an additional step in the right direction might be to find adequate solutions for the special challenges facing Latin America and the Caribbean.

(b) Technical Standards

A central —but often underestimated— strategic tool for technology regulation is standard policies. Rules and regulations of a great deal of economics are based on standards. "We live in a world built on product standards. You can make sense of these words because we share a common language" (Shapiro, 2000). Standards have been the decisive factor between success and failure for Information and Communication Technologies (ICT) going back as far as the 1860s, when the ITU's predecessor set international standards for the telegraph. Standards can distort market mechanisms, lead

[6] http://www.regulatel.org

to market failure and control technological development. The importance of technical standards has risen tremendously over the past decade, and is therefore a key part of Digital Economics in a global Information Society. This section will provide a short overview of the subject. It reviews current standards issues in Latin America and the Caribbean and discusses the benefits and threats standard setting imposes on development.

De Facto and de Jure Standards

Beginning with some basic definitions, standards are widely understood as systems, configurations, interfaces, methodologies or procedures which act as a tool to enable and ensure access to services, their portability, interoperability, and compatibility. Standards are recognized within the market, either through a formal process carried out by an official body (resulting in so-called *de jure* standards), or through a less formal process resulting in *de facto* standards. *De facto* standards can come into being as a coincidence (as illustrated by the story about the QWERTY typewriter keyboard layout standard, which was named after the letters that appear in the upper left-hand row on the keyboard). They generally come about through the widespread adoption of dominant players' proprietary technical solutions in the respective market (as with Microsoft Word). They may also be the result of an industry consensus reached by forums or groups especially created for this purpose (such as GSM or DVB). In the case of the latter, the associated technical specifications drawn up by industry forums are later embedded in a legal framework adopted by official standardization bodies. These then become *de jure* standards (IPTS, 2001). Traditionally, the three largest standard organizations are the International Electrotechnical Committee (IEC), the International Standards Organization (ISO) and the International Telecommunications Union (ITU).

While it is often claimed that the process of defining de jure standards is too complex and takes too long, they have several advantages. The "confidence factor" is one of them, for example. When a consumer buys a television set, he or she knows that it is compatible with the signals sent out by local broadcasters, since the national telecom regulator has set standards that all television sets must meet. De jure standards also provide investment certainty for manufacturers and suppliers. For example, the lack of widespread recognition of AM stereo as a de jure standard confused consumers and made them reluctant to buy AM stereos (Shapiro, 2000). Registered FM standards on the other hand, succeeded in most countries.

Setting industry and sector-based standards becomes more and more a process led by business-demand. Individual companies or special forums and consortia create de facto standards. The complexity and speed of development is making this necessary. The official standards bodies are still striving to ensure that the content of a standard meets the requirements for standardization, printing, distribution and maintenance. However such polices are often only applicable retroactively.

Following this trend in private sector leadership, standardization policy and its regulation have changed markedly over the past two decades. The traditional deterministic approach of policymakers and governments, inspired by monolithic telecommunications and broadcasting industries, has now given way to a more market-driven process of standardization mechanisms.

Proprietary and Open Standards

Technological solutions may be built on either proprietary or open standards. The main factors influencing the decision of whether to build the technology on a proprietary or open standard, are the rate and direction of technical progress and the composition of market demand for the product or service affected by the standard.

In order to enable the inventor of a technological solution to commercialize his innovation and recover initial spending, intellectual property rights regimes have been established, which protect investments into research and development (Abarza, Katz, 2001). This mechanism should act as an incentive system for innovation by helping to secure a first-mover advantage in the marketplace. Once such a protected innovation becomes a de facto standard it is usually termed as a "closed" or proprietary standard. The specifications and the ability to exploit the standard are usually subject to and protected by intellectual property rights, enforced through restrictive licensing and royalty schemes. Proprietary standards usually create separate "user circles", with every one of them "locking-in" its customers. Customer lock-in is as commonplace nowadays in Latin America and the Caribbean as anywhere else in the world and affects many consumers, from pay-television subscribers (e.g. pay-per-view) and software (office programmes) users to mobile telephone users (SIM Cards). Often these "closed circles" are further exploited by vertically integrating other proprietary solutions. Famous examples of proprietary standards include Microsoft Windows and Office, cmdaOne, Adobe Acrobat Reader or RealAudio.

Given the different welfare benefits and industry interests in integrated and compatible systems, protected proprietary standards are frequently "opened" for general use. The PC standard was originally a proprietary standard sponsored by IBM. After the standard was "opened", it became a platform for complementary products produced by a vast number of companies throughout the world. Although IBM did not retain proprietary control of the standard for the PC platform and is now setting standards through the consensus of a number of major actors, the company benefited in many different ways from the rapid growth of the market created by this platform, and has certainly recovered its initial research and development costs (IPTS, 2001).

There is a general perception that open standards are in the public interest as they facilitate interoperability of technological systems. Open standards reduce the threat of lock-in because there are multiple suppliers in the market making the consumer's transition from one provider to another much easier. With this common ground, standards reach a large scale much more rapidly and consumers benefit from the increased positive network externalities associated with larger markets. A further advantage to users of open standards would be enhanced competition. Enacting open standards would bring companies into direct competition with each other on a common platform. Perhaps the most important argument in favour of open standards in Latin America and the Caribbean would be the certainty that with open standards market development will not depend on the success or failure of the dominant firm. Examples of open standards are TCP/IP, MP3, Java, GSM, UMTS, DVB and open source software such as Linux.

Key for the development of proprietary and open standards are the so-called network externalities (also network effects). They play a fundamental role in the behaviour of digital markets, whereby the value of a product or service of a network increases by (X^2-X) with each new user.[7] Network effects distort rational market mechanisms. In many cases it is not possible to separate the relative importance of network effects from the technical superiority of a given product. Once their tremendous powers unfold, every later attempt to introduce a more optimal alternative usually fails because the market is "locked-in" by its own scale.

The existence of network externalities can be exploited in favour of proprietary or open standards. Suppliers try to combine proprietary technologies with network externalities to consolidate market dominance,

7 Often "networks externalities" are described with "Metcalfe's Law", which states that "the value of a network increases exponentially by the number of users connected to it". However, stochastically this equation (value of network=X^2) does not make sense, since it would not create value to connect with yourself. Therefore it should be (value of network= X^2-X).

at the expense of wider competition and interoperability between different devices, platforms and services. On the other hand, network externalities are the best insurance for the prevalence of open standards, as open standards often reach economies of scale faster than closed standards.

If the competition between different proprietary solutions is to be resolved and a dominant competitor or group of firms to emerge-through a process which Shapiro and Varian (1998) call "standards war"—then it is likely that this will reduce economic efficiency. The use of economies of scale and network effects of the dominant player will lead to high entry barriers, with the result that the dominant firm will have monopolistic pricing powers.

STANDARD WAR ON MOBILE TELEPHONY

Maybe the most famous standards war of the last decade has been fought (mainly in the U.S.) between two 2G mobile telephony alternatives, TDMA and CDMA. Before the "war" ended at the end of the decade in favor of Qualcomm's proprietary standard CDMA, the European 2G open standard GSM had already taken over 71% of the world's 2G mobile market (by June 2001). The open standard GSM was the lucky winner in the worldwide market, since the "official selection" in favor of this standard in Europe and elsewhere, enabled the technology to spread faster then its two competitors, which by then had wasted valuable and time and resources fighting the standards war. As a result, even though many still claim CDMA is technologically superior to GSM, most mobile telephony development in the world is now focusing on the GSM/ GPRS/ UMTS (W-CDMA) migration to 3G systems. The CDMAone/ cdma2000 evolution path to 3G only seems to have a future through the introduction of interoperability with the prevailing GSM evolution path.

Source: Martin R. Hilbert

To avoid wasting more resources and prolonging the standards wars, an increasing variety of groups with common interests have been forming so-called standards forums and consortiums over the last two decades. This process brings together market players in industry forums, where technical specifications are drawn up by consensus and subsequently officially recognized by standardization bodies (IPTS, 2001). The fact that many independent groups have participated in these forums has lent legitimacy to the activities of the forums and consortia.

Such organizations can range from very small alliances (like between Philips and Sony, as they created the "Red-book" standard for the CD in 1980) to larger consortia such as DVB (Digital Video Broadcasting). DVB is a consortium made up of about 300 companies from more than 35 countries, in the fields of broadcasting, manufacturing, network operation and regulatory matters that have come together to establish common international standards for the move from analogue to digital broadcasting. A couple of organizations like this have been emerging over recent decades, bringing together not only private companies, but also user groups, research laboratories, other standards bodies, and governments. A famous example of a standard organization that incorporates the private and the public sector is the World Wide Web Consortium, created in 1994 (w3.org). There are also supra-organizations, which unite different standardization bodies, and therefore integrate their various private and public participants, in order to take advantage of synergies (like the 3rd Generation Partnership Project (3GPP.org) created for mobile communication standards in 1998).

The licensing of standards resulting from such cooperation could be achieved by cross-licensing and/or using patent pools. However, since mostly open standards emerge from such cooperation, licensing often takes place on "fair, reasonable and non-discriminatory" terms.

Strategic Significance of Standards for Development

Making standards a strategic development tool can be a highly effective policy. Generally there are two approaches to drawing up these policies. The first one is based on market Darwinism. In competitive markets, the best solution will prevail. No other force provides a better selection process than market forces. However this requires time and resources, as well as very competitive and established market mechanisms. While this approach is very popular in developed economies like the United States, it is questionable whether it would be appropriate to apply this approach to developing, with incomplete markets, little consumer power, scarce resources and which are highly dependent on foreign investment. Applying market Darwinism to these markets frequently results in lock-in effects into "dying" standards.

Rather than this first approach in which "the-market-selects-its-standard", the second approach is one in which the standard is expected to create its market. In this approach, affected parties seek a consensus on a common open standard. This strategy is typically used in Europe.[8] The standard selected is naturally an open standard. The costly and time consuming standards war phase is simulated in open standard forums and consortia, and subsequently recognized as the official open standard. On this common standard base, market development accelerates and the

8 In Europe common open standards became indispensable in order to reduce technical barriers to trade under the European Union single-market procedures, by providing reference points for quality.

standard becomes widespread in a short time. It is important to underline that the contracts signed under the World Trade Organization (WTO) do not allow using standard discrimination as "trade barriers". Therefore, the selected standard never becomes an official government mandate, but is rather an informal public-private sector consensus. However, the risk of selecting one open standard, is in selecting a technically inferior solution to that which would naturally emerge through competition. This risk is increasing as standards are prematurely selected.

The decision on whether to opt for the "market-selects-proprietary-standard-approach" or for the "selecting-one-open-standard-approach" requires considerable economic analyses. Often a rule-based mechanism cannot be found, and authorities need to analyze case by case. These economic analyses have to take into account the national institutional framework (especially regarding property rights regimes and patent systems), existing regulating boards, dependency on foreign investors and existing forces of self-regulation. They need to consider competition policies, existing entry barriers and entry barriers that will be introduced in the future, trademarks and reputation, uncertainty and technical characteristics, speed of technical evolution, as well as the chance to create complementary markets, etc.

Creating complementary markets for example, is paramount in Digital Economics, given the importance of the first-mover advantage in the content business. The example of analogue TV is a case in point. The early adoption of the NTSC standard for broadcast television in the United States has led to a constant compromise between available and soon-to-be-available technologies in light of frequency allocation policies. It produced a markedly inferior standard to the PAL and SECAM standards later adopted in Europe and in many other parts of the world. In this case, it could be claimed that the standard was officially adapted too early. However, the early adoption of the immature NTSC standard, supported the development of complementary markets. The early entry of United States television broadcasters into colour television programming has been a decisive factor for the current advantages the United States has in the television content market, even if the later standards PAL and SECAM offer superior features. The TV content industry in the United States had a clear first-mover advantage over European followers. In conclusion, there is a lot of pressure between setting one consensus standard early on and waiting long enough to see which standard provides the best technical solution. Getting the timing right becomes critical and is an essential part of the economic analyses.

One issue that arises from these kinds of strategic approaches is, of course, the effect on competition, and anti-monopoly or anti-trust laws.

Standard settings reached by consensus and the "selecting-one-open-standard-approach", avoid the intense head-on competition of standards wars between proprietary standards. Open standards also permit greater competition in consecutive vintages of product designs, since open standards enable many companies to provide products and services that compete on the same technical platform. In other words, cooperative standard setting tends to decrease competition along some dimensions (especially between different technological platforms), while at the same time it is expected to increase competition on other dimensions in the future (especially between producers and suppliers of the same platform) (Shapiro, 2000). This theoretical pattern would lead to the conclusion that the two available alternatives would be, (a) highly competitive standards wars, followed by the establishment of a proprietary standard solution with little competition; or (b) the non-competitive selection of an open standard with subsequent high competition on a common platform.

Latin America and the Caribbean are, generally speaking, some years behind the technological frontier. The great standards wars are not fought directly in developing countries. Foreign investment and strategic considerations of individual firms distort the mechanism of standards wars in the incomplete markets of developing countries. Once a specific proprietary solution has "won" the standards war in developed markets, it is easy for this company to capture developing markets afterwards. This is creating tremendous and nearly uncontrollable monopoly powers in developing economies Therefore, it is questionable if solution (a) would make sense in Latin America and the Caribbean.

A logical conclusion would be that common open standards would fit better in developing countries. With open standards, monopoly power (like that which exists in the office software sector in many Latin American and Caribbean countries) could be prevented, and competition assured. However, open standards are not a panacea and their introduction is often not feasible. When open standards do not directly benefit producers and users do not have what they perceive to be an adequate substitute, proprietary standards will prevail. Proprietary standards also bring some "additional features" with them, which are rarely found for open standard products. For example the reputation and guarantees an individual company provides for its proprietary solution is often a reason for consumers to opt for the proprietary solution. Also educational services, which allow the client to efficiently use the product, are more commonly found with proprietary technology. Additionally, path dependencies and switching costs often prohibit the introduction of open standards. It is, claimed, for example, that the use of open source software would be a solution better suited for developing countries. Claims like this often neglect the fact that the open-source software model has not yet demonstrated the capacity to create an independent market for training, support, and maintenance, even though the user requirements are much higher for open-source software. Concrete and far-reaching public-sector policies would need to be found and implemented, to make up for these market failures. In this respect, it seems, the market is not capable of introducing and maintaining an open standard model by itself.

The example of software demonstrates very clearly another reason why most of the time proprietary standards are prevailing in developing economies. Open standard technologies often do not have a lobby to promote them. It is very hard for developing countries to turn down the possibility of obtaining large amounts of foreign investment, made by a company that wants to promote its proprietary standard. This short-term search for foreign investment could then, in the long run, lead to a scenario where one proprietary technology establishes a monopoly in the developing country, and entry barriers will not permit competitors to enter the market. As a consequence, the opposite would be achieved. A flow of foreign investment might get restricted in the long run and additionally the speed of development, as well as prices, would be regulated by the owner of the proprietary technology.

The dependence on one prevailing proprietary solution also increases the risk of running into a "dead-end". It makes the country depend on success and failure of the individual firm. If the monopoly proprietary solution does not manage to survive the forces of creative destruction, it will become a so-called "orphaned technology". The evolutionary path of the technology ends, and it is replaced by a new system. Technological evolution inside the country will be disrupted and switching costs for the users are tremendous. Open standards, on the other hand, reduce a country's dependency on mistakes made by an individual firm, as well as having the positive side effect that their "openness" reduces entry barriers and therefore favours the participation of local firms. By participating in open standard consortia, developing countries can even take part in the creation of new technological standards, and can assure that the particular characteristics of their countries are taken into consideration while the new technology is developed. In this respect, developing countries would stop being merely "standard takers", but start becoming "standard makers" as well.

In conclusion, it is clear that it is not always in the interests of a developing country to blindly seek to maximize foreign investment, without considering the far-reaching consequences this could have for internal technological development.

Standards in Latin America and the Caribbean

Two important examples of the development of worldwide standards in Latin America and the Caribbean are analogue television and 2G mobile telephony.

As mentioned above, the NTSC television standard in the United States is a markedly inferior solution to the PAL and SECAM standards that were introduced later. This did not stop the NTSC in capturing markets in large parts of South America, Central America and the Caribbean. Only Argentina, Uruguay and Paraguay went for PAL. Brazil decided to develop a hybrid of European and U.S. standards called PAL-M.

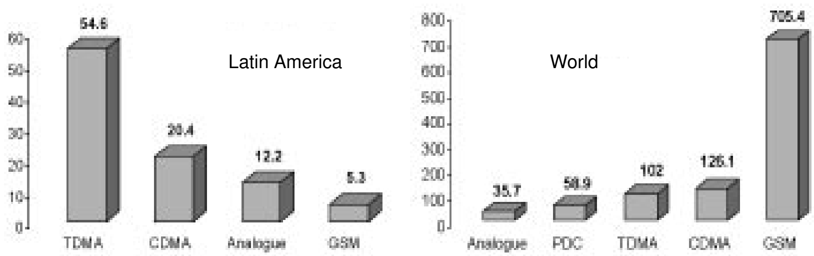
The resulting varied landscape of analogue TV in Latin America and the Caribbean cannot be explained with the help of one of the commonly valid standard setting strategies. First of all, the adoption of TV standards in the region did not follow the theory of successful market Darwinism, as a large part of the region was captured by the inferior NTSC standard. Secondly, the consensus selection of one common open standard, with resulting economies of scale and creation of complementary markets (such as the content industry) are not a justification for the Latin American analogue television standard scenario. Instead of profiting from economies of scale, the different television standards have rather proven to act as a huge obstacle to the free exchange of content in the region. The bottom-line to this is that no regional strategy for standard setting can be found in the case of analogue television standard setting in Latin America and the Caribbean.

Another example of the complex regional landscape is 2G (second-generation) mobile telephony. After a decade of heavy investment into building out far-reaching 2G telephony networks based on TDMA (IS-54) in Latin America, the evolutionary path of the standard came to an end. At the end of the 1990s it became clear that TDMA mobile operators would have to switch to one of the other 2G mobile telephony standards (GSM or CDMA) in order to keep up the progressive migration of their networks from 2.5G to 3G. Unfortunately, synergies (and therefore valuable resources) get lost this way. Especially for small countries, this can mean a severe setback in telecommunications development. According to the national telecommunications operator of Suriname in the Caribbean (Telecommunicatiebedrijf Suriname Telesur) the change from current TDMA to a GSM network will cost the operator two-and-a-half times the company's annual turnover.

Almost 60% of 2G cell-phones found in the region work with the orphaned technology TDMA. This makes up for more than 50% of TDMA technology worldwide. Obviously, standard strategies for 2G mobile telephony in Latin America have not been guided by one of the commonly valid standard strategies either. The prevailing standard neither possesses technological superiority (even worse, it is a dead-end), nor did the region opt for the worldwide accepted open standard GSM.

2G MOBILE TELEPHONY STANDARD DILEMMA IN LATIN AMERICA (JUNE 2002)

(Millions of Users)



Source: 3G Americas, June 2002.

GSM is creating large economies of scale worldwide, which is not only resulting in roaming and equipment production benefits, but also in investments for future development standards and complementary markets. European manufacturers assert that one reason for GSM's phenomenal success is that the licensing fees charged are very low. In other words, it is an open standard. This has allowed multiple manufacturers to enter the market, creating intense competition and driving equipment prices down. In contrast, CDMA is a proprietary standard. Qualcomm charges license fees on each CDMA handset and base station that is sold. However, CDMA has managed to capture —and therefore control— a large part (22%) of the Latin American 2G cellular market, while the open standard GSM hardly captures 6% of the market. This might be explained by some of the reasons discussed in the previous section (especially the uncoordinated search for direct foreign investment).

It is very costly and inefficient in terms of development to get stuck in such a "dead end" of an orphaned standard such as TDMA. The longer standards wars last, the more users and the more investment into the eventual loser technology will be orphaned and the higher the social welfare costs of slower market development will be. To be effective, any interventions that seek to influence the initial formation of standards must be fast and incisive to avoid the creation of a substantial number of 'orphaned' users. Interventions to accelerate the process of establishing standards can be rule-based and will reduce the extent to which users are excluded (orphaned). Despite the importance of this latter approach, too little research and too few specific proposals for regulatory intervention have yet been produced. Until now, the selection of an open standard would be the best alternative available to reduce the risk of running into a "dead end". With open standards expansion of economies of scale and competition is very fast. Many different market players can work with the open standard and the amount of research and development increases the likelihood of a successful future migration path. However, until now, open-standards have not had a powerful lobby base that pushes for their adaptation in developing countries. This can lead to irrational standard scenarios in developing countries, as seen with analogue TV or 2G mobile telephony in Latin America and the Caribbean.

Standard Strategies

Technical standards have always been used as a means for economic development. Technical standards have appeared (and are used) as non-tariff barriers and hence serve to protect national industry. Furthermore, they can be used to enhance or reduce competition, to support the creation of new markets and to favour investment in innovation. However, drawing conclusions from the situation in Latin America, the only logical strategy behind standard selection in the region has been the uncoordinated search for Foreign Direct Investment (FDI), which neglects the importance of a regional development strategy regarding evolutionary technological development (ECLAC, 2001a). Regrettably this has often turned the region into the "battle field of foreign interests", which then prohibits smooth technological development within the region. Without an established mechanism for standard issues, domestic interests have to yield to the immense and often arbitrary powers of transnational market forces.

Perhaps the greatest lesson to be learned from the past decades of broadcasting and telecommunication standard issues in Latin America and the Caribbean, should be in recognizing the strategic importance of technical standards. Policies on technological standards are often far less complex in developing regions than in Europe, North America or Japan. In Latin America and the Caribbean, technological standards are not "created", but rather selected. For the time being, the crucial decisions about technical standards in Latin America and the Caribbean are not about interfering with the mechanisms of technical innovation, but rather about focusing on minimizing negative effects of orphaned systems and avoiding the misuse of proprietary de facto standards as a tool for monopoly power.

Reviewing the evolving ICT environment it becomes apparent that the coming years will see the introduction of systems that integrate the main information, broadcast and communication networks. This process, often referred to as ICT-convergence, requires serious strategic planning. On the one hand, it is necessary to ensure that the existing systems, and the ones that are to be adopted, will be integrated smoothly. On the other hand, the negative effects of orphaned systems and misused de facto standards need to be minimized.

However, technological development will continue after the first steps of the ICT-convergence. Electronic payment systems, B2B market place mechanisms and the like will need to find their standards, for example. Experimenting with different standards to find the best solution for the countries in the region should become an established part of the legislative process to support standard selection. Brazil's extensive process of testing digital television standards during 2000 is a best practice[9] (SET/ABERT, 2000). However, one factor of great importance, that may limit the process, is the high costs involved in such tests (SET/ABERT, 2000). Since many Latin American countries share common geographical and socio-demographic characteristics (which are important in order to select an adequate standard), an institutionalized and region-wide mechanism for standard testing could help to exploit synergies and ensure more coordination in Latin American standard policies, by giving non-mandatory recommendations.

This independent forum could also deal with questions regarding the evaluation of proprietary standards or the introduction of open standards. For, example, will proprietary technologies, sponsored by dominant players, result in the adoption of sub-optimal '*de facto*' standards, to the detriment of competition, consumer welfare and competitiveness in Latin American economies? If the risk of such an outcome is real, will it be necessary to defuse it by encouraging the adoption of open technical compatibility standards through a range of public policy measures, aimed at intervening in the marketplace to bring about the desired outcomes? What concrete policy actions can be taken to enact the adoption of open standards? Or will interference with regards to standard settings only restrict the flow of

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9 The largest and "most complete tests in the world" regarding digital television platforms, have been carried out in Brazil (see Section "Digital Television" in the Infrastructure Section). The results of these tests grabbed worldwide attention and are the leading point of reference for many countries around the globe that are currently in the process of taking a decision about digital TV standards. Some Latin American countries have recognized Brazil's effort and are closely observing the process. Others have even already declared they will follow the recommendations found in the Brazilian testing process.

foreign investment in Latin America? These and similar questions need to be evaluated over and over again through profound economic analyses.

Looking further ahead, it will also become essential for Latin America and the Caribbean to become directly involved in global standard-creating mechanisms, such as the large forums and consortia in Europe and the United States. If the region continues to stay out of these international processes, it will be minimizing its potential to participate in future technology issues, even before the new technology has been introduced.

2. Judicial framework[10]

This section examines the different legal approaches to Internet legislation in Latin America. Many of the region's countries have started to introduce new legislation to close the gap between existing rules and those needed to deal with the demands of the digital era. This study has examined the different doctrinaire and legislative approaches.

(a) Legal doctrine and legislative trends

To date, one tendency in legal doctrine (Peña, 2001) has basically described the categories affected by the Information Society: digital signatures, on-line contracts, on-line consumer protection, practices restricting trade, the right to privacy, public freedom on the network, intellectual ownership of domains and network crime. This doctrine has sought to include natural elements of information technology science in its analysis, based on what has been referred to as the technological foundations of legal analysis (Lessig, 2001).

With traditional or formal legislative models, governments have opted to modify national legislation by reforming the Civil Code. They have also applied model laws developed by different international bodies to establish common rules or harmonize existing rules and eliminated restrictions affecting specific countries. Concretely, they have referred to several model laws prepared by the United Nations Commission on International Trade Law (UNCITRAL),[11] as well as initiatives from the United States and the European Union. The UNCITRAL Model Laws[12]

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10 This section was contributed by Manuel José Cárdenas, international consultant.

11 Known in English by the initials UNCITRAL and in Spanish as CNUDMI.

12 This is the Model Law on electronic commerce approved 16 December 1996 and the Model Law on electronic signatures approved 5 July 2001. Both laws can be found at: www.uncitral.org/sp-index.htm

regulate solely those aspects affecting electronic trade and electronic signatures.

Alternative legislative models attempt to establish self-regulation, inspired by and applied in the United States,[13] which initially was rejected in Latin America because of its strong ties with formal European tradition. While the legal system in Latin American countries is based on the Napoleonic Code, the system in the English-speaking countries of North America is based on Common Law. The former is more formal, because it is based on written law, while the latter is less so, because it is based on custom. This has led some analysts to consider that the legal framework in Latin America is unsuited to resolving problems arising from new communications technologies and business practices (Ariz, 1999). The region has adopted Codes of Conduct, however, which establish that the parties involved in the virtual world respect conditions of equality, the same standards as the real world, respect bandwidth and data transition time, cooperate on fraud control, and guarantee the security of others. Thus, for example, the Buenos Aires Chamber of Commerce approved a Code, called "*Líneas de Guía*" (guidelines), to treat users in an honest manner, provide accurate information, and guarantee advertising standards. Similarly, Brazil's publicity self-regulatory council, CONAR, resolve disputes about on-line publicity based on standards it has developed in this area.

While the United States initially preferred self-regulation, more recently it has accepted the need to legislate for some specific sectors,[14] which in the future will provide greater scope for convergence among the different judicial systems in the Americas.

Gaps and limits to harmonization efforts

Gaps in harmonization efforts to date need to be examined, keeping in mind the specific legal issues covered by the UNICITRAL model laws and the aspects they do not cover.

Initially the UNCITRAL working group, which prepared the draft model law on electronic commerce, considered it appropriate to achieve a high degree of certainty and harmonization of legal regulations in this area

13 Initially, in the United States Internet users considered cyberspace an area of "freedom without anarchy, control without government, consensus without power" (Lessig, 1999).

14 The United States has passed laws on electronic signatures (Electronic Signatures in Global and National Commerce Act) and intellectual property (Digital Millennium Copyright Act and Anti-Cybersquatting Act). In July 1999, the National Conference of Commissioners on Uniform State Law approved the Uniform Electronic Transactions Act, establishing uniform provisions for the use of electronic communications.

through negotiating a detailed accord. However at the same time it urged caution to maintain a flexible approach on certain issues for which it would be premature or inappropriate to legislate. Similarly, it also considered it unwise to leave some issues to be solved by the contractual approach, because this method cannot resolve certain problems that arise from binding legal rules or domestic jurisprudence. Above all, it thought it unwise because the parties could refuse to recognize the rights and obligations of third parties. Thus the idea arose of drafting a Model Law that would constitute a balanced and harmonic body containing legislative regulations that each country could incorporate into its domestic laws as a special law or an amendment to the relevant existing legislation. The Group also sought to develop a Law acceptable to States with different economic, judicial and social systems.

MODEL LAW ON ELECTRONIC COMMERCE AND MODEL LAW ON ELECTRONIC SIGNATURES

The fundamental purpose of the model law on electronic commerce is to facilitate the use of modern communications and information storage media, for example Electronic Data Interchange (EDI), e-mail, and faxing, with or without the support of the Internet. This is based on establishing functional equivalence criteria well-known in paper-based traffic, such as the concepts "written", "signature", "original". The model law, because it provides criteria to evaluate the legal validity of electronic messages, will be very important in increasing the use of non-paper communications. To complement general rules, the law also provides regulations governing electronic commerce in specific areas such as merchandise transport.

Article 6 of the model law on electronic signatures complements the previous law by establishing that when the signature of an individual is required, and this is done by electronic means, it will be considered valid if it is fail safe for the ends communicated in the data message. The same article establishes when a signature is considered fail safe and that Article 3 establishes what is known as technological neutrality in the sense that any method is valid for considering that the signature meets Article 6 requirements. Thus UNCITRAL, when establishing technological neutrality, focuses solely on requring compliance with three functions or roles in terms of electronic signatures: i) The function of the signer (issuer or subscriber of the code) ii) the certification function and iii) the confidence function.

Source: Manuel José Cárdenas

Although it was thought that the UNCITRAL Model Laws would serve as an umbrella for achieving legislative harmonization among the region's countries, the reality is that the initial legislation governing electronic commerce presents several differences in terms of data messages, electronic signatures and certificates.

In terms of data messages, the harmonization gaps are evident in the requirement that an electronic data message satisfy traditional requisites in order to be considered equivalent to a written message. While Colombia's Article six of law 527, 1999,[15] follows the Model Law's recommendations for "functional equivalence", in Mexico[16] rules on electronic commerce establish that electronic data messages must satisfy the requirements established in the civil and commercial codes. That is provided they are, i) attributable to a specific person, and ii) that they are accessible for later consultation. Draft laws in Argentina[17] and Brazil,[18] in contrast, contain no provisions expressly establishing legal equivalence between data messages and traditional paper-based messages, thus creating a legal vacuum and preventing judges from issuing legal opinions on obligations based on electronic documents. In Peru[19] and Venezuela, while rules have been issued covering data messages, they are very general and remain without their accompanying regulations.

Similar vacuums appear in terms of electronic signatures. In theory, legislation governing electronic signatures should meet three requirements: that they be non-discriminatory, in the sense that the electronic signature should have the same legal weight and validity as the handwritten signature; that they should be technologically neutral, in the sense that they are not linked to a specific technology; and should respect the parties' autonomy, so that the interested parties can reach their own agreements regarding the use and recognition of electronic signatures. With regard to these three attributes, the situation is as follows:

- Non-discrimination: In this sense, Colombia's Law 527 is identical to Article 7 of the UNCITRAL Model Law, which establishes non-discrimination against electronic signatures when a method is used to identify a person and it indicates that that person has approved it and the method is fail safe and suited to the ends for which the data message was generated or communicated, in light of all the circumstances involved. Mexican legislation[20] establishes that electronic data messages

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[15] Law 527, 1999, defines and regulates access and use of data messages, electronic commerce and digital signatures and defines certification bodies.

[16] Decree, 29 May 2000, amends and reforms several sections of the Civil Code for the Federal District in Common Material and for the whole republic in federal areas, the *Código de Procedimiento Civiles* (civil procedures code), the *Código de Comercio y de la Ley federal de Protección al consumidor* (commercial code and the federal consumer protection law).

[17] Draft law on digital signatures. On 15 August 2001, it was partially approved by the chamber of deputies.

[18] Draft law Law No. 679, 1999,

[19] Laws 27,269 and 27,291, 2000

[20] Decree, Note 14

meet requirements established in the civil and commercial codes that require a signature to be i) attributable to a specific person and ii) available for future reference. The draft legislation in Brazil differs from those of Colombia and Mexico in that it does not expressly guarantee the principle of non-discrimination in the case of electronic signatures.

- Technological neutrality: The requirement that legislation not be linked to a specific technology is essential, given the dynamics of information and communications technology convergence. In this sense, there is little uniformity among different Latin American laws. Under Colombia's Law 527 and Brazil's draft law, only digitally signed documents have the same legal weight as those with a handwritten signature[21] or are considered "originals".[22] Argentina's draft law only recognizes the digital signature, excluding other methods for expressing consent.[23] Only Mexican,[24] Peruvian and Venezuelan laws and Chile's[25] draft legislation establish genuine technological neutrality, without indicating any specific technological requirement for the signature. The lack of harmonization in this area prevents international transactions in which different jurisdictions may or may not recognize electronic signatures for reasons based on the technologies with which they were generated.

- Autonomy of the parties: Latin American legislation on electronic commerce does not authorize the parties to determine for themselves what constitutes an acceptable method for an electronic signature. Although this system is not covered by the UNCITRAL Model Law on electronic commerce, it is covered by Article 5 of the UNCITRAL Model Law on electronic signatures. This article expressly establishes that the parties can make exceptions to the law or modify its effects through common agreement, except where this agreement is invalid or ineffective under the applicable law.

Latin American legislation governing certificates also presents substantial and procedural differences. This lack of uniformity limits the growth of electronic commerce in the region. These differences have to do

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21 Article 28, Law 527
22 Article 14, draft law
23 Article 2, draft law
24 Decree, Note 14
25 Draft law on electronic documents.

with certification authorities, procedures and mutual recognition of certificates.

- Certification authorities: Although Latin American legislation seeks to establish public infrastructure to create third party confidence through certification authorities, how these authorities are to carry out their duties varies. Argentina and Brazil[26] allow these authorities to function with or without a license. Chile's draft law also permits functioning without a license. This reduces the cost of certificates, because where a license is required certification bodies must meet rigorous technical and financial requirements. This is the case in Colombia, where Law 527[27] requires that certificate-issuing bodies meet financial, technical and personnel requirements. Mexican law includes no rules in this sense, which has been criticized by the private sector.

- Procedures: The procedures established in Latin American countries' legislation for determining the identity of certificate subscribers also shows limited harmonization. Brazil's draft law requires a formal application and a personal presentation, thus ensuring a high degree of certainty about certificates. Colombia's Law 527 only requires certification bodies to establish rules governing its relations with subscribers, without establishing any special requirement for the latters' characteristics.[28] Mexican legislation is silent on this point.

- Mutual recognition of certificates: Lack of legislative harmonization is also apparent in this area. Colombian legislation[29] establishes that certificates issued by foreign certifiers can be recognized on the same terms and in the same conditions as those required of national certifiers. In Venezuela, certificates are valid if they have been issued by a recognized certification service provider. Brazil's draft law on electronic commerce is also restrictive regarding foreign certificates, although requirements have little in common with those of Colombia. According to Article 50 of the draft law, foreign certificates must have the same judicial value as those issued by national certifiers, requiring that the country issuing the certificate be party to an agreement for

26 Draft law, Note 18, Article12; Draft law, Note, Articles 24 and 25
27 Article 29, Law 527
28 Article 43, Law 527
29 Article 43, Law 527

legally recognizing certificates, and that for this purpose the ministry of science and technology must issue a list of foreign certifiers that meet these requirements. Argentina's draft law on digital signatures establishes that certificates issued by certifiers authorized in other countries are recognized as equivalent to those issued in Argentina, if the foreign certifier meets analogous requirements to those of Argentina and has been licensed in compliance with the voluntary licensing program agreed upon by Mercosur member countries, or falls within this program if these are countries in the process of joining, or where special agreements exist in this regard. Mexico is completely different from the countries mentioned above. Because no special requirements for electronic signatures were required, electronic commerce transactions can be carried out with signatures.

As the above comments indicate, the Model Laws are limited to recommending steps to ensure that data messages and electronic signatures are valid under law, adopting a regulatory framework governing the security of electronic commerce, and establishing, in light of the principal of autonomy of the parties, some supplementary rules for regulating electronic contracts. At the international level, other fields have come under regulation, establishing for example that most Internet transactions are services and therefore should be covered under the rules of the World Trade Organization's General Agreement on Trade in Services or that aspects involved in copy right, particularly anything related to domain names, should be covered by international rules established by the World Intellectual Property Organization (WIPO) and the Internet Corporation for Assigned Names and Numbers (ICANN).

THE EUROPEAN UNION'S EXPERIENCE AND EXAMPLE

As is well-known, the European Union has established a single market that guarantees the free circulation of goods, services, persons and capital, within which information society services play a special role. In this context, the eEurope Initiative seeks to reach all citizens. With these goals, the European Union has worked within the guiding principles of the UNCITRAL Model Laws on a regional basis that goes beyond the specific territory of member countries. To do so, several guidelines and recommendations were approved, with the most important and most useful as examples for Latin America summarized below.

(continued)

The European Union's experience and example (concluded)

Directive on electronic commerce (approved on 4 May 2000): This Directive views information society services as being limited by several judicial obstacles arising from different legislations. It also views information services being limitedby legal insecurity about national regimes applicable to services, which work against the healthy functioning of internal markets create barriers and make the freedom to establish an information society less attractive.

To overcome these limitations it defines electronic commerce as a *distance contract* and establishes the golden rule that control of services in the information society should be maintained by the country where the activity originates, to guarantee the effective protection of general interests. As a result, services are subject to the judicial regime of the member state where the provider is established, with two exceptions: i) This does not apply in the case of consumer protection laws, because in this case the latter country's law is applied; ii) This applies only to the services of persons established in the European Union. No prior authorization is required to guarantee a service provider access to information society services. This includes rules about making and implementing contracts and encourages the creation of Codes of Conduct to apply the relevant rules.

Directive on electronic signatures (approved on 13 December 1999): This Directive does not regulate electronic signatures in detail, but rather defines common requirements for certifying electronic signatures and certification services. It ensures that all products and services associated with electronic signatures can circulate freely and are governed by the legislation of the country of origin. Finally, it defines the requirements for creating a digital signature and establishes that this instrument has the same value as a handwritten signature. This is so if the digital signature can be attributed to a single signer, is based on an authentic certificate, and is created using a secure instrument, thus respecting the principle of technological neutrality.

Directive on consumer protection (approved on 20 May 1997): This Directive treats contracts made over the Internet as *distance contracts* and spells out the conditions that this type of contract must meet. It requires that the offerer provide prior information to the consumer on contract clauses, that there be documentary confirmation of same, that the right to retract be recognized and that the burden of proof is on the offerer.

Recommendation on operations using electronic payment instruments (approved on 30 June 1997): This recommendation complements the previous Directive establishing a suitable framework for legal enforcement, guaranteeing transparency and avoiding fraudulent operations. These recommendations are voluntary, because the idea is for those interested to agree on their own rules and only when these are insufficient will the Commission adopt compulsory legislation. These cover all electronic means of payment, establishing minimum information to guarantee transparency and setting the rights and obligations of contract parties, seeking to distribute them evenly between the issuer and the rights holder.

Source: Manuel José Cardenas

Conclusions

The legal framework should be considered the "natural" companion to the development of the Information Society, particularly where it is fragmented at the regional and world levels. What is important is that it remains in line with changes, keeping up with trends to avoid being left behind.

The regulatory framework that governments adopt must include measures that protect the public interest, stimulate innovation and competition, and do not favour any particular technology. Nonetheless, the private sector is also responsible for guaranteeing that commercial practices generate a sense of security and trust, including effective "self-regulation", as the case requires. "Self-regulatory" initiatives should be welcome to the degree that they do not damage general interest. These are particularly timely in the case of B2B transactions.

In Latin America and the Caribbean a cooperative programme to promote the convergence of the regulatory framework should move forward. This framework must be clear, predictable, non-discriminatory, stable and at the same time flexible, favouring expansion of access to ICTs. Considering that Internet is of a global nature, efforts to harmonize regulatory frameworks should take this into consideration and not try to duplicate them at the regional or national level, but rather act congruently and compatibly with a global focus. In this sense, countries must follow the issues being dealt with in the multilateral sphere closely, particularly those that affect commerce in services and taxes within the WTO.

Applying the guiding principles of the UNCITRAL Model Laws in the region's countries has helped to modernize their legislation on commerce and electronic signatures. However, this legislative labour has two limitations. On one hand, there are certain limitations intrinsic to the Model Laws themselves, which leave their application and interpretation in the hands of different countries' authorities and thus don't guarantee their unity. On the other hand, they do not provide a complete set of rules for these areas. The first aspect makes the process of harmonizing legislation incomplete, presenting several gaps and contradictions among the different countries' laws, and the second means that several issues, which could be very useful to harmonize, remain pending.

3. Intellectual property[30]

Important factors that help the transition to an Information Society

[30] This section was written in cooperation with Jacqueline Abarza, Consultant of ECLAC's Division of Production, Productivity and Management.

are property rights on knowledge and information and the guarantee that such rights will not be challenged. The difference between private and public goods, and therefore the role that these play in intellectual property is a strong argument in the current debate about issues such as open versus closed platforms. Closed standards depend on copyright protection of an essentially private nature, while open standards create public goods that allow different business teams to develop their own company-specific interoperative technological designs on a common and open platform. This allows different business teams to develop their own company-specific interoperative technological designs in order to protect their product. Both options will have significantly different impacts on the development of competition, the range of choices available to consumers, and the development of the contents industry downstream from the digital sector. Clearly the co-development of the technological, institutional and legal elements, referred to as intellectual property, is a central issue for the transition to the Information Society. It is also undoubtedly one that requires lengthy consideration regarding the future of Latin America.

Dominant nodes in the network (which are points at which new technological knowledge is generated) and intellectual property rights are crucial factors that help the transition to a digital economy. When referring to intellectual property rights this can also mean any other institution that guarantees the exclusive rights to claim the benefits and royalties from the new technological knowledge and communicational content. Thus, in the case of the conventional model involving a representative firm, perfect competition and technological know-how viewed as a freely available exogenous production factor, the advisable public policy approaches the laissez-faire model. In the case of production organized in networks we must imagine public policy as guaranteeing appropriability of the benefits of knowledge generation, but also regulatory strength capable of blocking a situation whereby the nodes central to the network take advantage of their dominant market positions. Managing, administering and appropriating the benefits of technological knowledge used by the network together constitute an issue crucial to the new behavioural model that we are attempting to describe and the rules of intellectual property undoubtedly acquire importance as a key factor in encouraging more dynamic behaviour on the part of productive agents. Potential benefits must be weighed against the consequences in terms of generating dominant market positions and blocking competition.

A second field in which intellectual property rights play a crucial role in the transition to the digital world has to do with copyright, trademarks, domain names, designation of origin, etc., all of which —as within the non-digital world— play a major role in the conformation of the competitive model that develops in the case of Internet portals and business web pages.

(a) Interoperability, 'public goods' and intellectual property rights

Intellectual property rights provide an important base on which the new digital economy is built.

There are very different philosophies in the world on this subject. While Europeans tend toward open standards on intellectual property, which favors economies of scale, interoperability and helps develop "public property", Americans tend to support private platforms, protected by intellectual property rights. This latter choice often creates a "lock-in" effect in intellectual property rights meaning that once a specific standard has been chosen and consolidated, a society's development path toward the digital era has also been fixed. While the European view encourages greater market competition on a common and 'open' platform, more room for small and medium-sized firms to enter the market and the development of the local contents industry, the view in the United States favors economies of sclae and scope based on specialization and intellectual property rights as a means of encouraging private initiatives. Clearly both paths would have different implications on equality and efficiency in the market affected. The path chosen will have an impact on the rate and nature of the path any given country attains in its path towards a knowledge-based society. Every country should be able to democratically choose which road it wishes to follow and it should not be chosen for them by default. Unfortunately, Latin America has made little progress in this sense in recent years.

(b) Domain names and other intellectual property issues on the Internet

Just as trademarks are important mechanisms in non-digital markets for building up a company's prestige and reputation, they are also important in the world of electronic markets and web sites. Problems with trademarks are not restricted to the physical world and can be greater in the virtual world, as electronic markets tend to operate worldwide. These problems also affect other kinds of intellectual property, such as patents and copyright.

There are many abuses of intellectual property rights on the Internet that could be considered as illegal in the physical world and that are difficult to classify as such in the virtual world. Intellectual property rights in the physical world are typically territorial and exclusive. That means they apply within the borders of a particular State where they have been recognized and their owner has the right to prevent others from using these rights, without his authorization.

The fact that such a concept of borders or territories does not exist on the Internet, combined with the massive reach of the net, its multi-purpose nature, and the fact it is used for things that were unimaginable before, all contribute to conflicts over intellectual property. The internet's ability to reproduce thousands of copies of a work almost instantaneously by just tapping a few keys and storing them in virtual media, or just as easily modifying, manipulating and massively distributing these works has recently started affecting copyright. Nonetheless the internet's capacity to distribute products at a global level, especially knowledge-based products, is one of its advantages. These distinctions from the physical world and the growing number of Internet users has led to a new approach to intellectual property that could produce great changes in the traditional system.

Identifying Internet actors and intellectual property

When Internet was still in its infancy and was merely a domain of an academic elite, the potential problems that might arise in the field of commerce could not have been foreseen. Internet was originally a technology shared by a small group of players who knew each other well. It was only when companies and consumers entered the picture that the system exploded as it was faced with the need to accommodate the large unknown mass that is the global marketplace. At this time the strict principles of self-regulation collapsed and some modifications needed to be introduced. This led o the establishment of minimal regulations that permit the smooth functioning of the so-called electronic market.

Intellectual property, which was used, particularly by industrialized countries, as an economic policy instrument par excellence for developing States in the physical world, was directly affected by the self-regulation principle in effect in the virtual world.

To help identify Internet actors, the Domain Name System (DNS) was created. The DNS provides computers with an easy to remember address and a simple way of highlighting an electronic address, to help users to locate Internet sites easily. For example, www.eclac.org. The real actors on the network are computers that are identified by using an Internet protocol number. Behind the computers are the companies or the consumers.

While not exempt from difficulties and criticisms, the DNS has provided good results, offering excellent ways to identify the actors in the electronic market.

One of the main difficulties and conflicts regarding this identification system, which has produced endless debates, arose over the type of traditional intellectual property used in the physical world, the commercial trademark. The problems arose mainly out of the first come, first served principle and because the DNS administration's registry system does not require an examination prior to registry. Other problems have arisen in attempting to protect intellectual property in a global, limitless medium, with no centralized jurisdiction.

Conflicts involving Domain Names with different meanings

- Trademarks: The most obvious conflicts that have appeared have affected trademarks because both domain names and trademarks play a role in identification in one market or another. Typical breaches of trademarks have reached cyberspace. Today, people speak of "cyberpiracy" on the Internet, "cybersquatting," that is, registry of a brand as a DNS in order to sell it to the trademark owner, and "warehousing", that is the registry and storage of a trademark in order to sell it off to the best offer, which could include an offer from its owner. Because the DNS registry system is based on the first come, first served principle, initially trademark holders found their rights were not being respected.

- Names of organizations and persons: At first, of the seven Top-Level Domain (TLD) codes, the International Assigned Numbers Authority (IANA) reserved TLDs for international organizations, specifically for those created under international treaties. This has led to problems, however, because the abbreviations for international organizations vary according to the language in use. For example, the UN (United Nations) is ONU in Spanish; there's the WHO (World Health Organisation) and Dr. Who; WIPO itself (the World Intellectual Property Organization) was a registered trademark for textiles in the United States. In general, in terms of trademarks, national legislation and treaties forbid their being registered. People's names are an attribute inherent to the human being. As a result they have the exclusive right to control the commercial use of their identity, including the possibility of publicity being carried out using their name. The DNS has often seen this attribute affected, in particular in the case of famous or notorious individuals.

- International Names for Pharmaceutical Products: Managed by the WHO, this system provides a specific name to identify the pharmaceutical substance or active principle that can be used freely by any private agent. Nonetheless, some have been appropriated through DNS, for example, sildenafenil.com, more commonly known as Viagra, and amoxicillin.com. The WIPO recommendation in this case is to establish a system for notifying ICANN, which in turn notifies the administrator that this name has been registered, in order to cancel the registry in case it is improperly used.

- Geographic identifiers: This concept includes the names of States, codes for countries (ISO 3166-1947), names for places in countries. One very controversial case involved barcelona.com, registered by a company called Barcelona. The city government of Barcelona complained and its view was upheld in the legal dispute that followed. Some country regulations simply do not accept the registry of countries for ccTLDs, among them, Australia, Switzerland, Algeria, France, Peru, Sweden, amongst others. In the last WIPO report on this issue the recommendation was to only ban registration of the names of countries, regions, and municipalities.

One of the first issues that led to the questioning of the DNS as one of the main sources of the problems mentioned above, was the system for acquiring the right to register. In general, and especially at the start, no prior examination, coordination or association with the bodies managing trademarks or other registries in the traditional market existed. On the contrary, the system was based on the principle of "first come-first served".

Because of these difficulties, the Top-Level DNS system, which includes country codes, ccTLDs, which is more associated with the concept of the State or Government of a territory, has generally worked using requirements for applying for and obtaining the right to register, taking into consideration local situations in some cases.

The massive adoption of DNS —there were over 75 million Domain Names by 2002— the lack of links or coordination among existing organizations in the physical world, mentioned above, the lack of centralized jurisdiction and a dispute settlement system, increased the problems and therefore the criticisms of the chosen system of those interested in intellectual property.

Because of this, the White Paper on intellectual property recommended that the government of the United States should contact the WIPO to start a transparent and balanced process involving trademark owners and Internet community members to develop recommendations for trademarks and DNS, including dispute settlement proposals that cover cyberpiracy. In 1999, ICANN adopted what was called the Uniform Domain Name Resolution Policy (UDRP) for the (general) gTLDs.com,.net,.org.

This procedure made a compulsory and binding requirement that holders of the domains .com, .org and .net should register with managers that had adopted the UDRP. Some 22 of the country code administrators have adopted the UDRP system including, Mexico, Ecuador, Guatemala, Panama, Venezuela. Some have developed their own system with good results, as occurred in Chile, where the first stage of mediation is free to parties in conflict.[31]

Internet and intellectual property rights

Domain Names are not the only sources of disputes over intellectual property. The electronic market, in general, has negatively affected intellectual property rights, through breaches of these rights. It has also positively affected intellectual property rights, by serving as an important tool for broad distribution of intellectual property instruments.

Trademarks: Today trademarks are considered to be the top instrument in competition amongst companies. A trademark informs consumers about the business involved behind a product or service. The exclusive and territorial right to a trademark, which lasts forever, thanks to the possibilities of continually renewing it, has allowed companies to position themselves in markets with a reputation that not only allows them to attract customers but also to maintain them over time.

In terms of how the Internet works, trademarks play a fundamental role in the electronic market and their importance may even surpass their value in the physical world. Internet users need to acquire both a reputation and credibility among consumers, particularly because interpersonal relationships do not exist and products cannot be physically examined. However, it is difficult to extend the territorial protection of trademarks into the borderless, electronic world. Once a trademark is adopted on the Internet, it is visible to a potentially global audience and could be considered to have a global impact. Because of this, problems affecting trademarks in the physical world have spread to the virtual one.

Thus, what might be considered breaches of the use of trademarks in the physical world have been difficult to classify as such in the virtual world. One example is the use of the trademark as metalabel, that is, as a

[31] To date, 4,155 cases have been resolved, over half by the WIPO centre for mediation and arbitration. The cost of this centre is US$ 1,500 and the decision takes approximately 50 days from the start of proceedings. So far, the UDRP has been considered efficient. However, despite these regulatory efforts problems remain to be resolved in the area of intellectual property.

key word in a web site HTML code, so that Internet search engines can classify the site's contents. Therefore, a search engine looking through all websites containing a specific key word will list this site. In several jurisdictions, the trademark owners have questioned the use of their trademarks as metalabels. However, the problem is that these are not being used to identify concrete products or services. Some courts consider this as a breach of trademark, on the understanding that the use of the trademark as a metalabel could imply free promotion for the trademark holder. Or alternatively, by looking for the trademark holder's products, the consumer could end up by mistake at the website of a third-party that may eventually become a competitor, which could be considered as an act of unfair competition. Another problem is the co-existence of trademark rights corresponding to different people. Because of the territorial principle and specialized rights to trademarks, it is perfectly possible that different people could possess the rights to similar or identical trademarks in different countries, or even in the same country. This co-existence can be very difficult on the Internet, where a sign is potentially visible worldwide.

Patents: Traditionally, inventions are protected under a patent system that grants an exclusive, temporary right to owners to exploit their invention. Patent laws have been based on the fact that this exclusive right to exploitation encourages recompensation for the investments of the inventor and this encourages the creation of knowledge. The information contained in patent documents must be shared and is of prime importance, because it is organized and classified according to materials, owner and other factors. This information is increasingly becoming available online, through Internet-based systems. Considering the territorial nature of patenting laws, reproducing inventions, in the physical world, in States where the right to reproduce these inventions is not protected is not a breach of trademark.

Recently, patents have been granted to inventions of commercial methods developed through the Internet. One example is patent number 5,960,411 of the United States of America, granted to Amazon.com, which allows its customers to click and buy. This resulting trend in investing in creative economic activities for selling across digital networks, justifies the patent. Some have even proposed changing the patent system. This trend has been criticized, however, because these elements do not meet the traditional requirements for patents, such as level of creativity and industrial applicability. Detractors of the patent argue that it only meets the requirement for a novelty. In Europe, the prevailing opinion is that a patentable invention must be of a technical nature and that commercial methods should not be patentable because they involve solely intellectual activities.

Copyright and associated rights: As with trademarks, copyright has been enormously affected by the Internet. On the Internet, the transmission of texts, sounds, images, computer programs, audiovisual works, all protected by copyright, is now common. Moreover, the exchange of products, which range from information to the field of entertainment, constitute an important part of electronic commerce transactions. However, on the digital network these transactions have also been the subject of controversy, particularly because breaches of copyright have been committed against copyright holders.

Some typical ways of exploiting copyright in the digital environment involve transmissions on request, online transmission that locates an object on the website so that it can be captured by the end user. Once placed, anyone, anywhere, at any time can have access to the product. Another situation occurs with reproduction in digital networks. The Berne convention bans unauthorized reproduction "in any manner or form". This wording includes storage of a work in an electronic support. Similarly, placing work in an Internet data base and its reproduction on the web require a prior license, such as occurs with music in an MP3 format.

Breaches of copyright and other associated rights in this new electronic scenario pose difficulties that arise from the nature of the medium, the multiplication in its uses, uses that go beyond the territory of a single State, insecurity in electronic contracts, and particularly the lack of a competent jurisdiction to resolve these non-territorial disputes. In this sense, the WIPO treaties governing copyright (WCT) and performances and phonograms (WPPT) recognize the growing role of protection technologies, such as online management and licensing systems.

B. Financing

The endeavor to finance the creation of an Information Society will have to focus on creating and upgrading universal and cost-effective Infrastructure and Generic Service Layers, as well as actively seeking methods for financing corporate innovation and modernization in the different "e-Sectors." These two tasks require the joint effort of private, as well as public financing.

1. The macro and microeconomic background to the transition

The current Latin America and Caribbean debate on the transition to an information society is based on stylized facts and the counterfactual model of how developed industrial countries managed such transition over the last two decades. Such counterfactual model does not, however, constitute a satisfactory standpoint as from where to start our present discussion on this topic. The reasons for that are as follows: first, the average per capita income of developed countries is five to six times higher than the average for the region. Secondly, the macroeconomic fundamentals of developed economies can be considered as relatively stable, and economic growth, although moderate, has been sustained in recent years. As a result of that the macroeconomic scenario can be taken 'as given' in any debate on the transition to the digital era. Thirdly, the provision of public goods by the State and the existence of relatively strong regulatory environments and regulatory agencies can be taken for granted. This provides room for a more equitable and efficient transition to the digital era. All of the above means that the transition to an information society can be expected to take place under conditions of a more equitable and universal access to the goods and services of the information society. None of this applies to contemporary Latin America. With a few very notable exceptions, the countries of the region have not attained a satisfactory growth performance after their efforts towards trade liberalization and de-regulation and privatization of economic activities in the 1990s. Furthermore, the aggregate performance of many of them has deteriorated significantly in recent times. FDI flows —which facilitate most of the expansion of the basic physical infrastructure on which transition to the digital era is based— have diminished in past years, leading to some reconsideration as to the future rate of transition to the information society. In addition to the above, in various countries in the region the fundamentals of the economy are far from equilibrium, generating an uncertain macroeconomic 'climate' in which entrepreneurial "animal instincts" are far from buoyant. On the other hand, the provision of public goods is scarce and the regulatory environment and agencies responsible for designing and applying competition policies are still relatively immature. This means that competition still plays a minor role in determining an adequate market 'regime' for the transition to ICTs in Latin America. Moreover, we are talking about countries that have one fifth (or one sixth) of the per capita income of developed countries, so we can intuitively understand that the model for the transition to the information society is unlikely to be a carbon copy of the one followed by more developed industrial countries.

The discussion about the Latin America's transition to the digital era has therefore to be undertaken in the context of the current regional socioeconomic reality, as it is such reality what is going to determine the pace and nature of the Latin American transition to the information society. On the other hand, it needs to be considered that ICTs offer a new window of opportunity for economic and social development, which bears the potential to change the present reality. It should be clear from the start that given the prevailing local circumstances the role to be played by the State regulating and facilitating the transition to the digital era will be crucial, even more so than what such role has been in more developed industrial societies. Such role will take the form of regulatory activities strengthening competition and market discipline, and the provision of subsidies to the demand side, favoring accessibility to public goods. These public goods should secure universal accessibility to ICTs in societies that are intrinsically poorer than those of the industrialized world. New forms of public/private partnership will be needed in these markets in order to construct new forms of 'workable competition' and the distribution of public goods to society, so as to avoid the expansion of the 'digital divide'.[32]

Available evidence indicates that subsequent to recent market-oriented structural reforms the Latin American growth performance has been far from satisfactory. So has also been the overall rate of productivity growth, leading to a stable relative productivity gap vis a vis more mature industrial economies (Katz and Stumpo, 2001). At the macroeconomic level it is clear that the region is performing better than in the past. However, it is also clear that trade liberalization and market de-regulation efforts have not been followed by significant productivity improvements, neither by a steady reduction in the international production efficiency gap these countries exhibit in comparison to the world best practice frontiers. Nor does it seem clear that said reforms have induced significant positive results on the equity front. On average, poverty and unemployment have increased throughout the region (Katz and Stumpo, 2001).

With the opening up of the economy to external foreign competition, deregulation of markets and privatization of production activity in countries that are structurally poor as far as the domestic creation of technological knowledge is concerned —but relatively rich in natural resources and unskilled manpower— the production system and individual economic agents have responded by seeking new forms of production specialization. They have also and sought new ways of organizing production at the level of in manufacturing plants, in which priority is given to prioritizing a more intensive use of relatively abundant resources and there is a tendency tending to abandon 'knowledge-intensive' activities.

One possible explanation for the observed pattern of evolution is that throughout the 1990s the region has suffered the combined effect of an

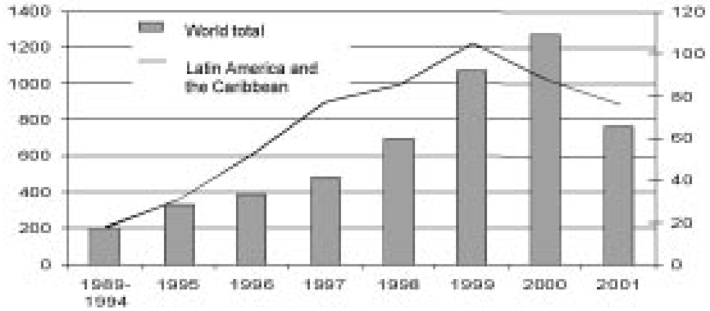
32 Both in the development of the 'Network of Networks', as the Internet is sometimes referred to, and with regarding equality of access and universality of services, the role of the public sector has been crucial in the industrialized countries, as shown, for example, by the act passed in the United States in 1966 on telecommunications and mandatory universal services (Laffont and Tirole, 1998).

uncertain and volatile macroeconomic regime and a highly 'defensive' microeconomic environment, lacking in major new investments and in innovation efforts. Such self-sustained vicious circle derived in low total factor productivity growth and in a persistent large productivity gap vis a vis more mature industrial societies (Katz, 2000).

DOWNTURN IN FOREIGN DIRECT INVESTMENT FLOWS

Foreign investment flows (FDI) to Latin America and the Caribbean decreased for the second consecutive year and the preliminary data for 2002 does not show signs of a reversal in that trend. Latin America experienced the world's largest cut back in global telecom carrier spending between 2001 and 2002 (62 per cent) (eMarketer, 2002). In view of the great importance of FDI for establishing the world's physical infrastructure for ITCs, it will be difficult to make progress in the transition to the digital era if there is a marked reduction in the growth rate of the basic ICT infrastructure.

Net inflows of FDI to Latin America and the Caribbean and the World
(in thousands of millions of dollars)



Source: ECLAC 2002

Summing up, the information available indicates that far from moving towards an information society with satisfactory growth and dynamic production structures and comparative advantages, the transition in Latin America is occurring amid increasing difficulties in sustaining macroeconomic balances and historical equality patterns. The restructuring of the production system has been shifting the balance in favor of sectors that make little use of technological know-how. With few exceptions, there are currently few examples of countries in the region that are launching new production methods with higher domestic aggregate value, innovating in technology, or seem concerned with creating universal access to ICTs. There also seems to be little competitive discipline in the key markets for the transition to ICTs. All of this should be taken into account when considering possible future scenarios for the development of ICTs in Latin America and the Caribbean.

2. Investing in the development of an information society[33]

(a) Foreign Investment and Telecommunications

During the late 1980s and early 1990s, Latin American policy makers decided to implement dramatic reforms, including opening up the economies to foreign competition, streamlining government bureaucracy and privatizing state-owned companies. This provided investors with further incentive to invest in the region and brought an unprecedented and much needed wave of foreign private capital. The telecommunications sector, long a bastion of inefficient and monopolistic practices in most countries, was typically among the first to be privatized in countries that were implementing reformist policies.

Large European telecommunication companies like *Telecom Italia* and *Telefónica de España* faced their own set of problems at the beginning of the 1990s. For years they had been given privileges in their countries and enjoyed the protection commonly accorded to state-owned monopolies. When the European markets began to open up, neither *Telecom Italia* nor *Teléfonica de España* was prepared for competing on a global scale. Growing competition obliged these companies to grow quickly or risk being taken over by larger European rivals. The telecommunications markets in neighboring countries in Europe were over-saturated and also faced stiff competition at home. The two telecoms companies were therefore forced to look elsewhere for acquisition targets and to expand.

Latin America and the Caribbean, where the telecommunications sector was still relatively undeveloped, seemed to be an ideal place for these companies to invest, given the similarity of their cultures and the growth potential offered in this untapped market. *Telecom Italia* and *Telefónica de España* were by far the largest investors in the Latin American telecommunications sector. *Telecom Italia's* first large-scale investment in the region occurred in the early 1990s in Argentina. Today its operations also include Bolivia, Brazil, Chile, Cuba, Paraguay, Peru and Venezuela. *Telefónica de España* has invested in Argentina, Brazil, Chile, Colombia, El Salvador, Guatemala, Mexico, Peru, Puerto Rico, Venezuela. In the cellular market BellSouth, along with *Telefónica de España* and *Telecom Italia*, has also been an extremely active investor in the region, with operations in 11 countries.

Before these companies arrived local telephone companies had suffered from a serious lack of capital that prevented them making

[35] This Section is a contribution of Mr. John H. Tonelli, Chairman and CEO of International Venture Partners, LLC.

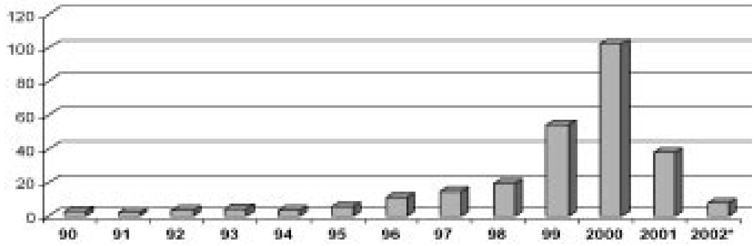
necessary upgrades in equipment. It was not uncommon for clients to wait years for a telephone line. The high costs of installing lines and the cost of telephone service, especially long distance, made it a luxury to have a telephone. For that reason, a large portion of the population did not have telephones in their homes. The newly privatized companies spent billions of dollars upgrading the telephone networks. By the late 1990s most of the region's incumbent carriers had foreign shareholders. Interestingly, the impact of privatization on the various markets was extremely different. In Chile, privatization and liberalization opened up the telecommunications market to virtually unlimited competition, which drove many competitors out of business. In Mexico competition was introduced gradually over a six-year period, allowing the incumbent carrier, *Teléfonos de México* (Telmex), to adapt to the changing environment. Brazil followed a path that was a combination of these two extremes, with competition introduced gradually and creating a duopoly, rather than a single company. In Argentina two operators (a partnership of *Telecom Italia* and *France Telecom* on the one hand, and *Telefónica España* on the other) received a seven-year exclusive license (1990-1997) to operate the telecommunication system.

The privatization of much of the telecommunications sector in the region was the first important step in paving the way for widespread Internet use and the region's transition to an Information Society. Without the extensive upgrades made to the telecommunications systems in Latin America and the Caribbean, mostly paid for with foreign capital, the available infrastructure would most probably not have been adequate to handle the Internet boom a few years later. If that had been the case, many of the region's most successful Internet entrepreneurs would never have got started.

(b) Venture Capital

Latin American Internet companies were the first companies to attract venture capital to the region on a large scale. Prior to 1995 only a handful of venture capital firms were dedicated to investing in Latin America. By the late 1990s the tremendous strength of the U.S. capital markets had contributed to the widespread availability of venture capital for ICT investments in Latin America. This was largely driven by a surge in ICT stocks and investors' desire to seek additional opportunities and higher returns away from the heavily saturated market in the United States. In 1995 approximately US$5.7 billion of venture capital was invested in the United States. By 2000, venture capital investment in the U.S. had increased to over US$100 billion, and it had become significantly more difficult to find attractive investment opportunities in the United States (NVCA, 2001). The abundance of capital available for high risk Internet ventures, coupled with a decreasing number of attractive opportunities in the U.S., helped fuel the tremendous wave of Internet investment in Latin America.

VENTURE INVESTMENTS BY YEAR IN THE U.S. (US$ BILLIONS; *ESTIMATE)



Source: NVCA (National Venture Capital Association), official website (http://www.nvca.org), 2001.

Over 1,500 start-up initiatives in Latin America received funding in 2000 from private investors and venture capital funds. Approximately 80% of these start-ups were in Brazil, Argentina or Mexico. During 1999 and 2000, most venture capital investments in Latin America were concentrated in the Internet sector (83%), with the vast majority of the Internet investments in media/portal operations. According to Bain Consulting, Internet-related investments in Latin America by venture capital firms and private investors amounted to US$ 700 million in 1999 and US$ 2.6 billion in 2000. Most of the investment in 2000 occurred in the first quarter of the year. Today, the ICT sector in Latin America continues to attract the largest amount of venture capital of any sector. During the first quarter of 2001, the ICT sector accounted for 83% of all venture capital disbursements in the region. Over 80% of these investments were made by corporations in strategic areas, rather than by private investors and venture capitalists.

Despite this huge amount of private equity activity, only four Latin American Internet companies have been able to access the public markets in the United States (El Sitio, Starmedia, AOL-Latin America, and Quepasa). Many telecommunications and infrastructure companies, however, were able to access the public markets in the United States and in Latin America. These companies, because of their size, have been able to obtain financing from a wide variety of sources that are not available to Internet companies.

After this "Internet goldrush" in 2000, global high-tech stock markets collapsed, which had multiple effects and therefore severe consequences on the availability of venture capital in Latin America. The rapid collapse of the Internet market in Latin America, was a direct result of the same type of external forces that initially caused it to surge. Because the amount of investment capital available to Internet projects diminished, companies that required additional funding to survive started to disappear. As in the United States and the rest of the world, investors in Latin America who ignored the common disciplined practices of venture capital investing experienced heavy losses. Blinded by the quixotic euphoria that marked this unusual period, investors did not place enough emphasis on credible track records, positive cash flow, co-investors/shareholders with deep pockets and exit strategies. Many of these early Internet investors had little or no operating experience in Latin America. Another factor that further contributed to the problem was the fact that many Latin American entrepreneurs lacked experience in the technology sector. The combination of these elements in Latin America and throughout the world contributed to the decrease in available capital for the Internet sector starting in the second half of 2000.

The outcome of the deficit of capital in the ICT sector is a tremendous industry-wide consolidation. Local telecommunications companies are particularly well positioned to capitalize on this trend. As evidence of this, ownership or control of Internet Service Provides (ISPs) by incumbent telecommunications companies increased from 23% in 1999 to 40% in 2000, according to the Yankee Group.

There are some very compelling reasons, apart from the strength of the United States' markets, why financing has been readily available for Latin American Internet projects. The region has consistently over the past few years been the fastest growing Internet community in the world. Around 90% of the users expected to be online by 2005 are not yet online and over 50% of the devices capable of being connected to the Internet are not yet connected.

Today the only companies in Latin America that can access international capital markets are established players and large, well-known companies, including the region's telecommunications companies. The willingness of venture capital investors to invest in new Latin American ventures is contingent upon their ability to free up cash in existing investments. Most funds are eight to 10 year vehicles. Unfortunately, the exit opportunities, which are so critical for venture capital investments, are currently uncertain in Latin America because of the lack of liquidity in both the local and foreign capital markets. Since most of the region's venture capital investments came between 1997 and 2000, these investments are still relatively young. Therefore, venture capital firms are unlikely to take a large loss by liquidating their investment at a time when valuations are so low.

(c) Obstacles and Challenges

The process of privatization and the significant progress most Latin American and Caribbean countries have made toward macroeconomic stability made the region attractive for FDI in the late 1990s. These capital inflows played a major role in the growth of the regional telecommunications industry up to 2001. The regulatory challenge in Latin America is to create an appropriate and transparent foreign direct investment policy that enables the public and private sectors to meet their objectives. In the telecommunication sector it will be necessary to maximize FDI inflows as well as establish a coherent development policy for the telecommunications sector that is aimed at simultaneously achieving corporate strategy objectives and national policy goals (ECLAC, 2001a).

The role of e-business has expanded rapidly in Latin America with growing international competition. IDC expects the Latin American business to business (B2B) market to increase twenty fold between 1999 and 2003. As with other markets, the business to consumer (B2C) market proved disappointing and funding for B2C initiatives quickly dried up as investors started to realize the lack of scale B2C firms have. Interestingly, approximately 47% of all venture capital invested in Internet-related companies in Latin America during 1999 and 2000 were targeted for B2C initiatives. This imbalance shows that markets see a very high growth potential in Latin American B2C e-commerce, or calls for an inevitable shift in capital market focus from B2C to B2B ventures.

Local financing has played a very small role in the overall information technology spectrum in Latin America. Angel investors (often referred to as “friends and family”) have typically been instrumental in financing companies in their early stages. There does not yet exist an established network of Latin American and Caribbean venture capitalists. However, it is essential that local investors take a more active role in financing ICT. The region should not be solely dependent on financing from external sources. Additionally, local investors are best positioned to identify and capitalize on new and unique opportunities, as well as manage their existing investments on an ongoing basis.

The region’s stock markets have failed to provide an adequate source of capital to ICT and other companies. The illiquidity of local markets has inhibited the growth of private investing because of the lack of attractive exit opportunities through initial public offerings (IPOs). Private investors seeking liquidity must rely on selling out to strategic investors, such as multinational companies that want to increase market share without having to set up an operation from scratch. In order for venture capital to increase substantially in the region, local capital markets will need to become more robust and a greater resource for investors. The liberalization of pension investment regulations allowing pension funds to invest a portion of their resources in local ICT could be one accelerator.

In order for the region's stock markets to be more effective in creating liquidity, more advanced securities laws are required to protect minority shareholders rights. Additionally, corporate governance laws need to be set in place to create a higher standard for officers and directors. Experience shows that this is a challenging task, as most Latin American companies are family-run businesses and their owners have traditionally been insensitive to the needs of minority shareholders.

Measures to enable and promote domestic growth must be contemplated to allow effective e-commerce between countries. E-commerce is inherently borderless and global in scope. Financial markets are skittish and fearful of protectionism. The creation of digital content and new technological advances requires flexible venture capital mechanisms. If the region does not want to fall too far behind in these ongoing technological developments, strong and stable financing mechanisms and markets are indispensable.

3. Financing a universal information society for all

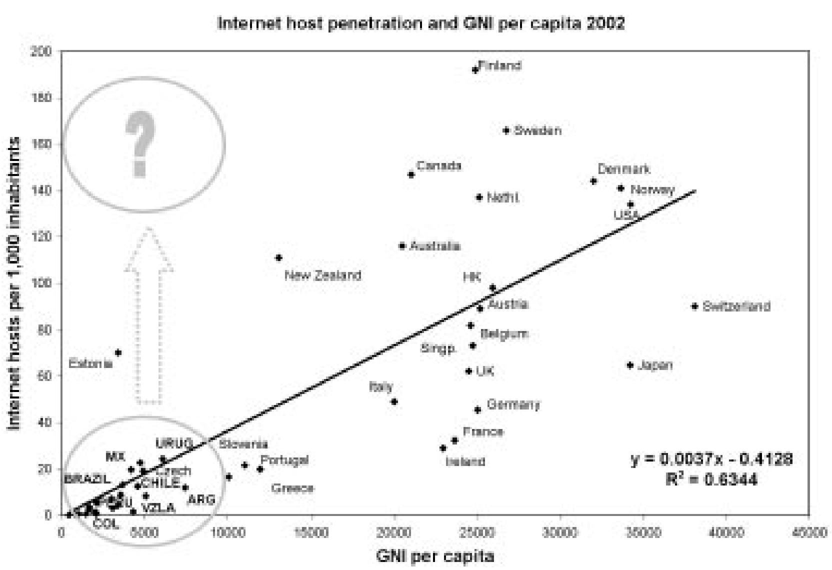
In a consensus declaration about ICT for development issues in 2000, Latin America and Caribbean countries stated that, "allowing the evolution of the Information Society to be guided solely by market mechanisms entails the risk of an amplification of the social gaps existing within our societies, the creation of new modes of exclusion, an increase in the negative aspects of globalization and a widening of the distances between developed and developing countries" (Declaration of Florianopolis, 2000). As the following section underscores, market mechanisms by themselves are unlikely to close the worrisome Digital Divide in the near future. Considering the actual role of the State in Latin America and the Caribbean, potential ways and lines of thought about how the challenging task of "Financing a universal Information Society for all" could be addressed, are analyzed. This task accounts for the creation of a global Information Society (Digital Divide between countries), as well as for a universal Information Society within a country (domestic Digital Divide).

(a) Market Mechanisms and the Digital Divide

The Digital Divide between societies is usually measured in terms of access to the ICT Infrastructure Layer, whereas ICT usage is positively related to income. Per capita income varied widely across the globe in 2002, ranging from US$ 40,000 (Switzerland, Luxembourg), to as little as US$ 400 in some countries in Latin America and the Caribbean (e.g. Nicaragua). There is a similar disparity of Internet hosts. While in Finland there were almost 200 Internet hosts per 1,000 people available in 2002, in Latin America and the Caribbean the number currently lies between less than one, to a maximum of 24 Internet hosts per 1,000 inhabitants.

Experience from Europe and North America shows that Latin America and the Caribbean needs to reach a level of 160 Internet hosts per 1,000 inhabitants to give around 70% of the population access to the Internet (example Sweden). Generally speaking, "closing the Digital Divide" in Latin America and the Caribbean, would require raising Internet access to such a level (see Graph).

NARROWING THE DIGITAL DIVIDE WITH AN INCOME PER CAPITA OF LESS THAN US$ 5,000?



Note: sample of 46 countries from five continents.

Source: Martin R. Hilbert based on Netsizer, «Internet Statistics» (http://www.netsizer.com), 2002.

However, given the disparate income distribution, in order to attain such high rates of access, ICT usage would need to be very income inelastic in countries with a low income per capita. In other words, ICT usage would need to become a priority for citizens in such countries. A large part of the low income per capita that is available to them would need to be allocated to ICT. As the graph shows, this does not seem to be the case. Income elasticity is high for ICT usage and the number of Internet hosts is very positively correlated to income. It seems natural that countries with lower income have lower user rates. The use of the technology is too expensive to be considered as an indispensable priority. Given the low income per capita in Latin America and the Caribbean (US$ 3,670 in the year 2000), it would go against all economic reason to assume that the region could currently close the Digital Divide (which would mean following the trajectory of the arrow in the graph).[34]

The situation worsens when taking into account the large discrepancies in income distribution within Latin American and the Caribbean societies. The highly unequal income distribution leaves the poorest 60% of the Latin American and Caribbean population with only 20% to 30% of the already very low overall income (ECLAC, 2001). While it seems like a big enough challenge to reach an initial Internet penetration of 30%-40% in low-income countries, the task of connecting the remaining 60% will be even more complicated. Given that 30% of the Latin American and Caribbean population are estimated (by the World Bank) to live on the equivalent of US$ 2 per day, the task of including that percentage into the Information Society seems more challenging than ever. In 2000, the average Internet access charge by service providers (ISP + telephone call charge) in the region's most important economies was US$ 1.4 per day, which represents 70% of the income of the poorest 30% of Latin America's population.[35]

The new technology seems to be too expensive to permit low-income countries to reach penetration rates similar to the ones in high-income countries. As the following graph shows, some countries in the region (especially Colombia, Brazil and Chile) are already spending over-dimensionally large amounts on ICTs. In a cross section of countries around the world, these regional countries were found way above the international

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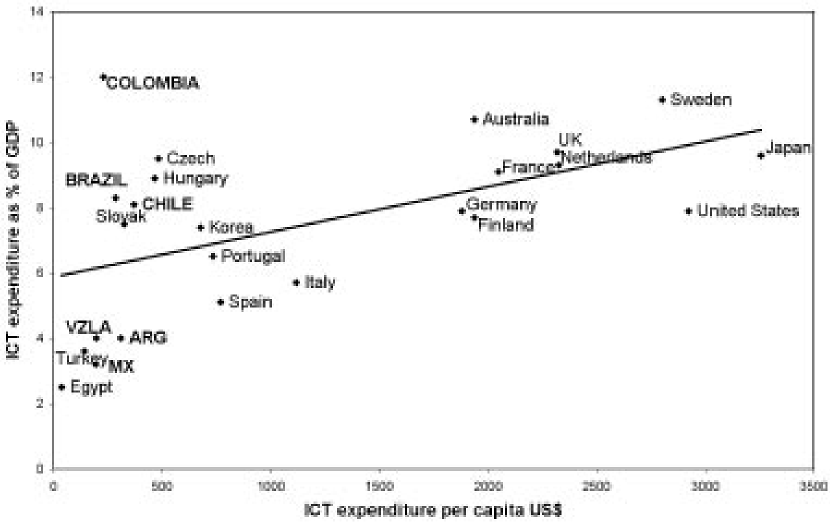
[34] However, as the graph impressively demonstrates through the example of Estonia, it seems to be possible for a low-income country to move in the right direction toward an "Information Society for all", —at least for a small country (Estonia has only 1.4 million inhabitants). It is clear that in Estonia, connectivity has been made a "government priority". This small case seems to be a first indicator that providing public sector leadership can be very beneficial. See also "Digital Dividend", presentation of T.Ilves, Minister of Foreign Affairs, Estonia; at "Digital Inclusion: Impact and Challenges of the Networked Economy for Developing Countries"; DSE, 2001; http://www.dse.de/ef/digital/pap0201e.htm; http://www.dse.de/ef/digital/ilves-e.htm.

[35] Monthly access charges by service provider in 2000 (ISP charge + telephone call charge): Argentina (US$ 30 + US$ 11); Brazil (US$ 33 + US$ 3); Chile (US$ 32 + US$ 7); Mexico (US$ 24 + US$ 3); Venezuela (US$ 28 + US$ 39), (ITU and WITSA, 2002).

average of ICT expenditure as a percentage of GDP. In relation to their GDP, countries like Spain, Portugal, Italy, Finland and the United States spent less on ICTs than Colombia, Brazil and Chile (see Y-axis in the ICT expenditure graph). However, in real terms, the total ICT expenditure in Colombia, Brazil and Chile was less than US$ 300 per capita in 2000, while the average expenditure in more developed countries lies around US$ 2,500 and above (see X-axis in the ICT expenditure graph).[36] With the market price of a simple and low performance computer being around US$ 500-600 in 2001, the capacity for citizens in Latin American and the Caribbean to access the Internet seems very limited.[37]

INFORMATION AND COMMUNICATION TECHNOLOGIE (ICT) EXPENDITURES IN 2000



Note: sample of 24 countries.

Source: Martin R. Hilbert based on WITSA (World Information Technology and Services Alliance), «ICT at a Glance Tables, WISTA Contribution to the World Bank Development Data Group» (http:/www.witsa.org/), 2002.

36 ICT expenditure per capita in 2000: Argentina US$ 310; Brazil US$ 287; Chile US$ 371; Colombia US$ 231; Mexico US$ 196; Venezuela US$ 199 (WITSA; 2002). In 2002, Latin America represents around 5.5 percent of the worldwide ICT spending (North America 40 percent and Europe 31 percent).

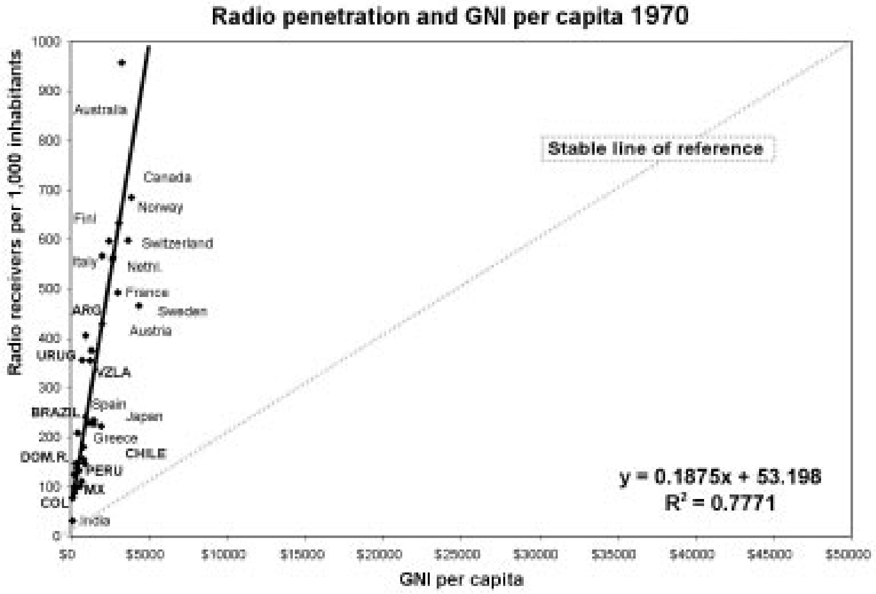
37 It needs to be taken into consideration that in order to access the Internet; more than a computer is needed (software, telephone charges, ISP charges, etc…).

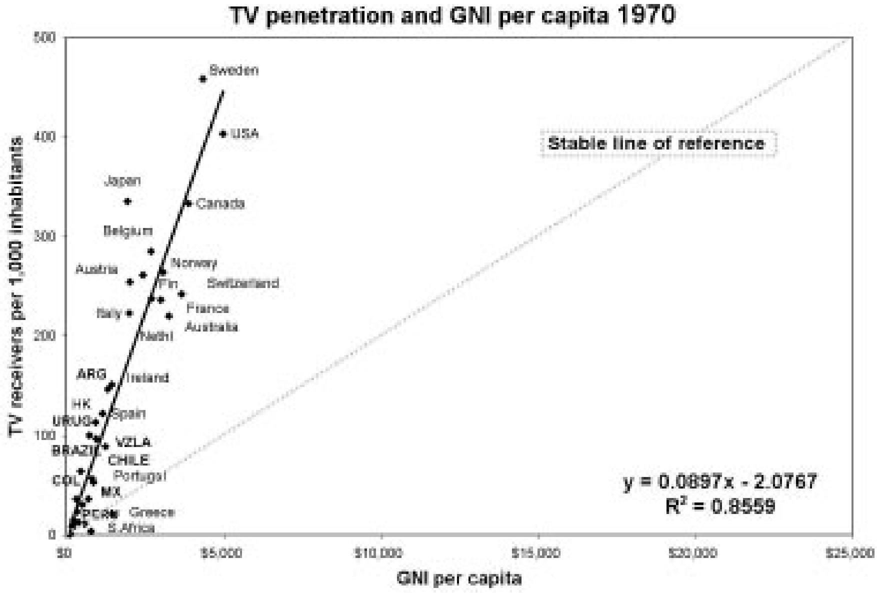
While some countries in the region (such as Mexico, Venezuela and Argentina) are still lagging behind in putting ICT expenditures as a priority, the low regional income in general seems to not permit them to spend a lot more on ICT.

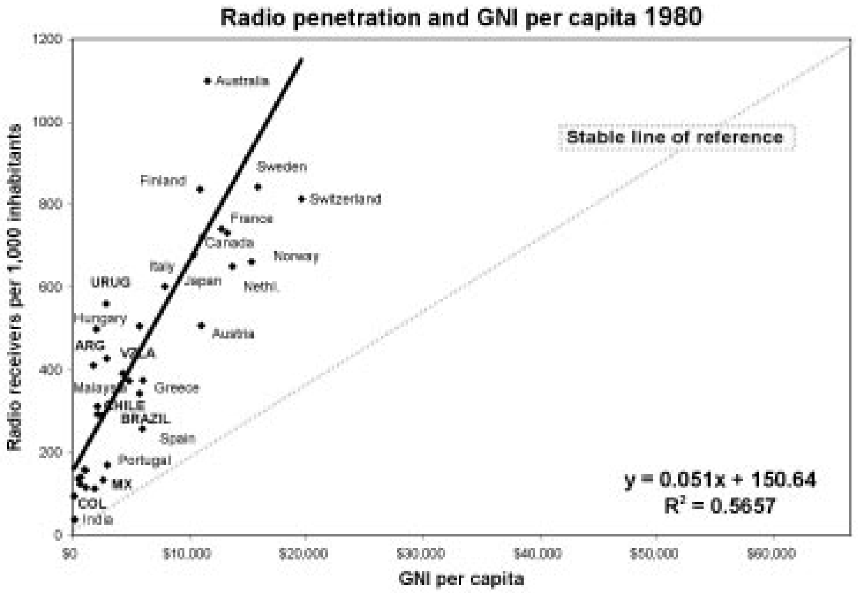
The basic hope lies in the fact that prices of ICT equipment and variable access costs could fall drastically over the next few years. Ceteris paribus to the available income per capita, this would also enable poorer citizens to gain access to the ICT infrastructure within a small time lapse. Over time, the regression line in the first graph ("Internet host penetration and GNI per capita 2002") would either move upwards in a parallel manner, or it would just equilibrate (moving towards a horizontal line, following the direction of the arrow), depending on whether high-income countries would reach saturation or not. This scenario claims that, over time, even countries with low-income can quantitatively close technology divides. (It needs to be underlined that this analysis is based on the basic variable "Internet hosts", which does not say anything about the quality of access (e.g. bandwidth, etc.), nor about access time. The analysis therefore proposes a "static world", without a constantly moving technological frontier. In this case, basic access to the Internet ("Internet hosts") would be the determined technological frontier).

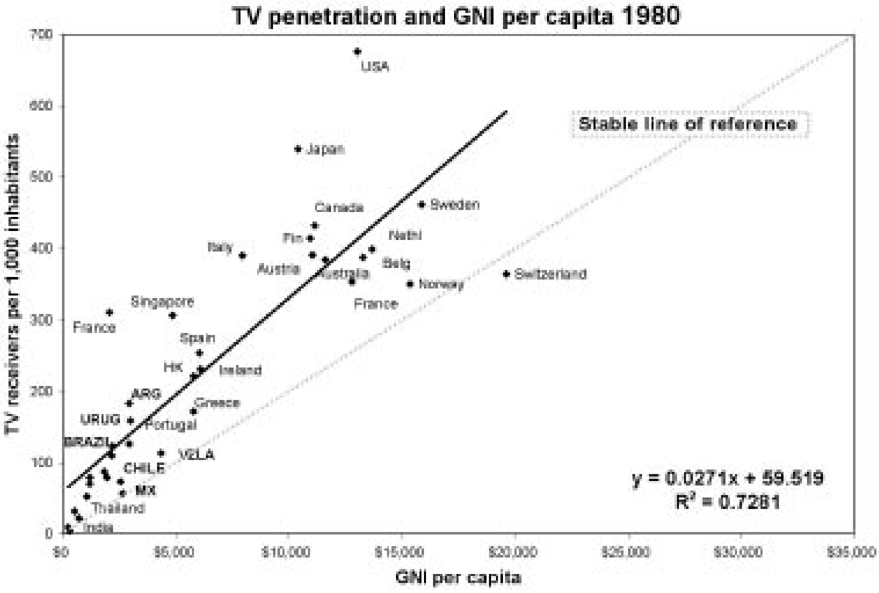
In order to get a better picture about possible development trajectories in the years to come, historical data —which refers to the diffusion of more traditional information technologies for example— could be used. Television and radio, were two predecessors of modern ICTs. It could be expected that at the beginning of the "TV-revolution" in the 1960s and 1970s there was a similar relationship between TV receivers and income per capita, as is currently found with Internet hosts and income per capita.

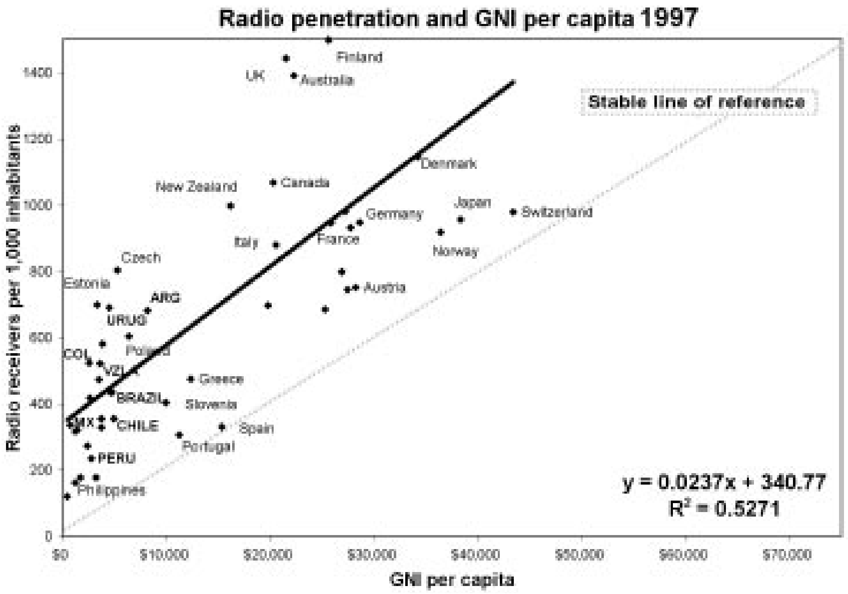
RADIO PENETRATION AND TV PENETRATION VS INCOME PER CAPITA
(1970 -1980 -1997)

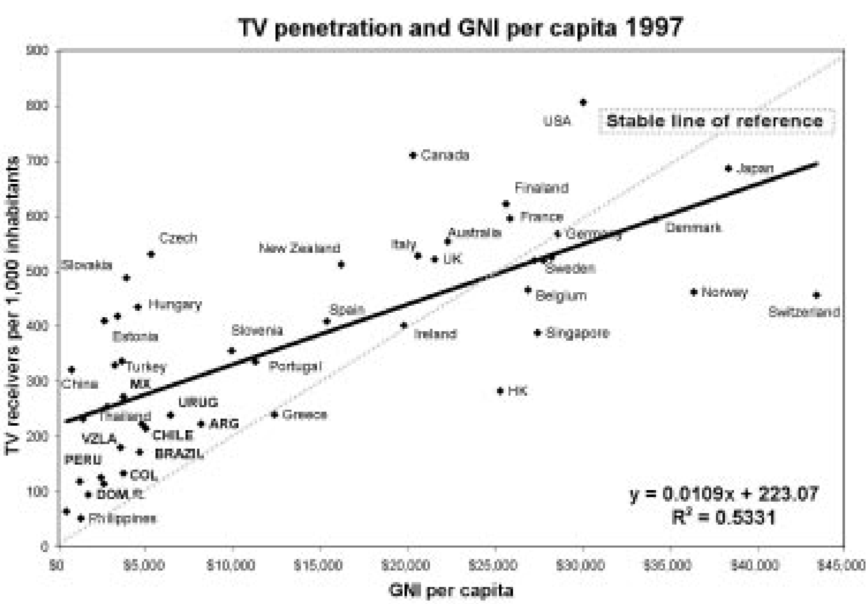





Radio penetration and GNI per capita 1980
Radio receivers per 1,000 inhabitants
GNI per capita
Stable line of reference
y = 0.051x + 150.64
R² = 0.5657
Australia
Sweden
Finland
Switzerland
France
Canada
Norway
Italy
Japan
Nethl.
URUG
Hungary
Austria
ARG
VZLA
Malaysia
Greece
CHILE
BRAZIL
Spain
Portugal
MX
COL
India


TV penetration and GNI per capita 1980
TV receivers per 1,000 inhabitants
GNI per capita
Stable line of reference
y = 0.0271x + 59.519
R² = 0.7281
USA
Japan
Canada
Sweden
Fin
Nethl
Italy
Belg
Austria
Australia
Norway
Switzerland
Singapore
France
France
Spain
HK
Ireland
ARG
Greece
URUG
Portugal
BRAZIL
VZLA
CHILE
MX
Thailand
India





Note: sample of 48 countries from five continents; the so-called "*stable line of reference*" refers to (y= 0.02x); the USA falls visually out of the radio graphs, due to its over-proportional penetration.

Looking at the graphs, it appears this is the case. In the early years of radio and television diffusion (see graphs from 1980) the relation between income and technology usage has been very strong. Over time the relation lost importance, narrowing the "radio and television divide". Both of the above-mentioned effects occur. First of all, the regression line moves towards a more horizontal position. That means that high-income countries experience a certain level of saturation, while low-income countries increase their penetration. Low-income countries grew faster than high-income countries in TV and radio penetration between 1970 and 1997.[38] It is a clear indicator for "TV and radio usage convergence" between high-income and low-income countries. Secondly, the regression line also moves upward in absolute terms. In 1970 the TV penetration in Latin America and the Caribbean has been between 20 and 150 receivers per 1,000 inhabitants. Almost 30 years later between 90 and 270 receivers were available for the same amount of people. This trend also accounts for radio information technology.

These results as far as access to TV and radio is concerned, raise hopes that Internet diffusion (the so-called Digital Divide) will eventually behave similarly. This implies that the Digital Divide might be closed over time through market mechanisms. However, it should be noted that (a) the diffusion process shown is very slow and (b) even after 30 years the access divide in TV and radio has not yet been "closed".

If we are expecting similar diffusion trajectories for Internet access, it could take some decades to significantly narrow the Digital Divide. The hope lies in the positive effects of increasing trade relations, augmented economic interactions and more and more global competition, which is accelerating the spread of technology. TV receivers spread faster than radio receivers did.[39] It required 38 years to reach 50 million users of radio information technology starting at the beginning of last century. From the middle of the century it took only 13 years to connect the same amount of

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[38] Natural Logarithms for radio penetration, whereas [y = log (radio)] and [x = log (GNI per capita)]
Year 1970: $y = 0.7284x + 0.2158$
Year 1980: $y = 0.6167x + 0.3421$
Year 1997: $y = 0.4272x + 1.0818$
Natural Logarithms for TV penetration, whereas [y = log (TV)] and [x = log (GNI per capita)]
Year 1970: $y = 1.5495x - 2.8899$
Year 1980: $y = 0.9289x - 1.1513$
Year 1997: $y = 0.4015x + 0.9373$
(Correa, 2002)

[39] See Footnote with Logarithms.

people to TV. At the end of the 20th century it took only four years to connect 50 million people to the Internet (ITU, 1999b). However, while technology diffusion might be faster nowadays, the Digital Divide might also have severer consequences and might be more dangerous than the previous "TV divide" or "radio divide". As already discussed in previous Sections of this book, excluding part of the society from accessing the heart of the Information Society creates dangerous socioeconomic and even political gaps. Access to the network of networks facilitates economic development, it assists the spread of general education, health issues, public administration, political information and participation, cultural development and all the things, which in the end aim to contribute to reaching and maintaining social peace within and between communities. If the Digital Divide does not narrow in the near future this would have a severe negative impact on equality issues within and among societies. Therefore, dramatic and far-reaching action is called for in order to close the Digital Divide in the nearest possible future.

(b) The Role of the Public Sector

According to traditional economic theory, the logical conclusion out of this scenario would be to call for government intervention. Market mechanisms do not bring the desired result within the desired timeframe. Where there is little or no incentive for the market to satisfy the "true demand" for goods and services, the State will have to provide the missing link. This is a long established mechanism. The motives for State interference range from welfare-economic arguments (market failure and efficiency, etc), to economically more intangible rights-, freedom-, and justice-orientated arguments (Ryan, 1989).

For example, health, education and social security are typical examples of basic goods that society believes should be provided for —and, where appropriate, actually consumed by— everybody (to a certain minimum level), whether the individual citizen likes it or not and whether the individual can pay for it or not. In a free market, many people might not receive a sufficient level of satisfaction in these areas. The solution consists of making them "public", so everybody can access them. A basic characteristic of these kinds of "public goods" is that they not only benefit the individual that consumes them, but also everybody else, as an externality of individual consumption. In the case of education, public access to all would result in an educated population contributing to the better functioning of society (Beckerman, 1989). Besides the fact that some citizens simply cannot afford the desired minimum level of such goods, it is also believed that people do not have the adequate information necessary to optimize the available resources for their long-term benefit. They lack awareness about the potential long-term benefits from the consumption of such goods and services. That is why the State needs to intervene, to promote, and even provide, the use of such goods and services to the "public".

It could also be claimed that ICT usage and digital behavior helps provide such goods. Digital behavior brings desirable externalities in decreasing information asymmetries, integrating fringe groups, strengthening of democratic mechanisms and long-term efficiency gains on a more advanced level of exchanging information, communication and coordination through digital networks. Since market mechanisms by themselves are not enough to provide ICT usage to the entire society in developing countries in the near future, the public sector has to take a leadership role, to promote good 'ICT usage'. If the State wishes to create a universal Information Society for all its citizens, the public sector will have to find mechanisms to provide ICT access to the part of population which cannot afford it.

While the discussion about the "basic human right to information and communication" is maturing[40] (Bucharest, 2002; UNESCO, 2002; WSIS, 2002; CV Mistica, 2002), and awareness about the necessity of a 'public good' called 'ICT usage' is increasing, the central question remains how such public goods could be financed?

In Latin America and the Caribbean the available alternatives for the State to finance such pure public goods are very limited. Taking on more debt to speed up the transition towards a universal Information Society does not seem to be an option. With an overall regional budget deficit of 4.9% of GDP in 1999 and 2000, the World Bank classified seven countries in the region as "severely indebted" in January 2002.[41] A further nine countries were classified as "moderately indebted".[42] Furthermore, the dominating neo-liberal development approach adopted by many Latin American and Caribbean countries in recent decades, which strongly emphasizes reducing the size of the public sector, has left the governments of the region with very little spending power. In an international comparison, it can be seen that Latin American and Caribbean governments play a very limited role in their economies (with the notable exception of

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40 Article 19 of the Universal Declaration of Human Rights, states that everyone has the right "to seek, receive and impart information and ideas through any media and regardless of frontiers", http://www.un.org/Overview/rights.html.

41 The World Bank classified Argentina, Brazil, Cuba, Ecuador, Guyana, Nicaragua and Peru as "severely indebted" in January 2002.

42 The World Bank classified Bolivia, Chile, Colombia, Haiti, Honduras, Jamaica, Panama, St. Vincent and the Grenadines, Uruguay and Venezuela as "moderately indebted" in January 2002.

Brazil) (World Bank, 2002c). Their European counterparts for example, consume twice as much a percentage of their GDP as Latin American and Caribbean governments do (World Bank, 2002b).

Such a weak public sector has limited the possibility of providing sufficient public goods. It might turn out to be rather difficult to persuade Latin American and Caribbean States and their citizens to justify allocating a large part of their relatively small public budget to be spent on ICTs to produce the pure public good "ICT access". In the present situation, it would also be difficult to boost State coffers again by increasing general taxation rates. The fierce worldwide competition for private investment between developing countries would not allow them to raise taxes sufficiently, to generate enough resources for the public sector to be able to close the Digital Divide.

Besides pure public goods, there are also so-called "semi public-" or "merit goods". They partially rival or compete with each other (meaning the benefit for one individual reduces the supply available to others) and partially exclude each other (the benefit can be limited to a selected group). Such public goods could be financed by the formation of "clubs", whose members consume the good (Tiebout, 1956; Buchanan, 1965; Helm, 1989). Agents "club" together to share the cost of (excludable) public goods. In some cases members of such clubs pay a minimal entry or membership fee. In this model, the club internalizes the public good. Shared goods and services such as schools, public theaters, museums or libraries fit the club model.

SOME SMALL COUNTRIES RELY ON STRONG PUBLIC LEADERSHIP

Evidence from small developing countries (such as Estonia, Costa Rica or Uruguay) show that strong governmental leadership can bring very beneficial outcomes. Uruguay and Costa Rica (both with a publicly-owned telecom operator) have the highest fixed line telephony penetration rates in Latin America and the Caribbean. Recent plebiscites in these countries underscore that the population is satisfied with the performance of the public sector, and does not wish to transfer its ownership to private hands. While such strong public sector involvement seems to be viable for such small countries (Estonia has only 1.4 million inhabitants, Uruguay only 3.3, Costa Rica, 3.8), for larger developing countries, privatized enterprises and competition prove more efficient.

Source: Martin R. Hilbert

Use of computers and bandwidth is surely a partially rival and excludible service. ICT usage would fit the club model of semi-public goods. The theoretical model of "clubs" has long been established in many developing countries. Libraries for example, have provided broad access to information (through books) for centuries, financed through a model of cost sharing. A similar idea lies behind the current concept of so-called “info-centros” (shared Internet community access points). Info-centros are established throughout the region, and aim to provide information access to the citizens who cannot afford individual access. Often such initiatives are subsidized by the national telecommunications authority, through specific “telecommunications funds” (see section “The Digital Divide” in the Infrastructure Section). The majority of those funds are sustained by collecting a fixed percentage (usually 1.0%) of the operative income of telecommunications operators. Despite the small size of such re-allocation activities, impressive results can be achieved through a minimum amount of resources, as experience from shared access to public telephony shows. In Chile for example, 21% of the population has only one public telephone per 1,000 inhabitants (in walking distance of four blocks). However without such an establishment they would have no access to telecommunications at all (Subtel, 2002).

There are more successful examples in the region where tax mechanisms are used in order to foster the implementation of ICT, such as in Ecuador in January 2002. Demonstrating its concern to provide “democratic access to the benefits of technology to all citizens”, Ecuador’s government ratified the Decreto No. 2143-A, which introduces “zero tariffs for the import of hardware and software” (Conatel, 2002). This reduces hardware and software costs by about 20%. With this policy the government aims to support access to the Infrastructure and Generic Service Layers.

While telecommunications funds or tax relief for hardware and software are very useful to help access to the Horizontal Layers, incentive mechanisms in the different Vertical “e-Sectors” can also speed up the transition towards the desired goal. This can be done by re-organizing existing incentive mechanisms. While the consumption of some goods and services is desirable, the consumption of others might not. A long established public sector policy has impeded cigarette consumption (usually through taxes), while promoting seatbelt usage. This kind of “paternalism” aims at nudging consumers gently in the direction of desired consumption patterns. The same mechanisms can be fine-tuned for ICT usage. The goal should be to replace some of the existing and inefficient methods of processing information. Through adopting digital activities, ICT can replace obsolete channels of communication or incomplete mechanisms of coordination and introduce the desired increases in efficiency, participation and democratic coordination. The Brazilian government used such incentive mechanisms to promote online income tax payments. The Brazilian tax agency has made it more difficult to declare earnings on paper and promoted to do the process electronically. As a result, it received more than

90% of total declarations via the Internet in 2000, only four years after the introduction of the system (Hilbert, 2001a).

Also general tax incentives are used to enhance digital practices in the Vertical Sectors. The United States promotes buying over the Internet through its law HR 1054 —which provides tax exemption for e-commerce. The United States government indirectly "subsidizes" the young e-commerce industry with an estimated US$ 13 billion which escape the government through its "Internet free-trade-zone". On an international scale, this assures that United States online operating firms have a decisive competitive advantage.

However, in States that are financially already very limited, the question of how to make up for such tax relief becomes crucial. In economic theory, the "Ramsey rules" (1927) justify high taxation of commodities in inelastic demand, in order to subsidize the usage of commodities with elastic demand. As pointed out in the graphs above, Information Technologies and ICTs are relatively income elastic. Inelastic goods and services will have to be found in the individual markets to subsidize the usage of the new technology.[43]

These kinds of incentive mechanisms are based on the assumption that individuals do not have all the information available to them to make the best use of their resources and therefore aim to guide behavior towards the desired outcome. Such mechanisms have to recognize the broad implications of digital practices. Digital behavior goes beyond the telecommunications sector. As discussed in various parts of this book, digital activities are rather a form of social and productive reorganization. Digital organization replaces and improves traditional information channels, obsolete communication processes and coordination mechanisms. The traditional "way of doing things" evolves towards a more efficient and complete "way of doing things" through digital networks. Cross-subsidizing and incentive mechanisms have to recognize this broad impact of digital practices. Such arguments opens up a whole new spectrum that seeks to reallocate resources-and creates "paternalism mechanisms" in all the different Horizontal Layers and Vertical Sectors. Such mechanisms will then help to speed up the adaptation of "ICT usage", and in the end narrow the Digital Divide within and between societies.

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[43] For example, it could be expected that traditional media (such as newspapers, journals and TV broadcasting) are less demand elastic than the new media (such as through interactive set-top boxes for digital TV). Cross-subsidization mechanisms between the "old media" and the "new media" (which then brings the positive benefits of interactivity, participation, etc.) would be one potential alternative to speed up the transition towards digital behavior.

Considering historical evidence from the spread of TV and radio receivers, there seems to be few economic reasons why the Digital Divide should narrow in the near future, if the transition towards an Information Society is to be solely guided by market mechanisms. Low-income countries will have to find innovative ways to efficiently use the limited resources available and provide a minimum level of ICT access to their societies.

In summary, worldwide competition for private investment between developing countries does not permit increases in the size of State funds from taxes. Also the experienced efficiency gains through privatized markets do not justify reversing private ownership and increasing size of the State coffers. The result is a small State with a very limited budget, which in many developing countries prohibits the public sector from setting up extensive support programs to achieve a universal Information Society in their countries. Cross-subsidizing incentive mechanisms, public-access models, visionary public paternalism and private sector involvement are the remaining policy options. Promoting "open standards", which can be understood as "global public goods", is another alternative (see Section "Telecommunication regulations"). Creative ways need to be found at a global as well as at a domestic level if a universal Information Society for all is to be achieved.

C. Human capital

1. Human capital for an information society

Given the fact that human resources and the workforce are referred to as "capital", already indicates the importance of the issue for development policies. On the one hand it raises hopes that the increasing importance of human skills and brainpower can help developing countries to break the vicious circle of capital shortage. It is claimed that human capital is far more widespread and easier to obtain in the developing world and in transition economies than financial capital, especially due to the advent of modern ICT (UN Millenium Report, 2000). On the other hand, educational standards are still very low in many developing countries. Considerable reforms and re-budgeting needs to be undertaken in order to meet the demanding challenges human resources face in an Information Society. This is especially true for the current situation in Latin America and the Caribbean.

The Diagonal Area "Human Capital" should analytically not be confused with the Vertical Sector "e-Learning" in the second part of this book. The first issue centers on the discussion on how the workforce can be prepared to exploit the ICT-paradigm adequately. As will be explained in more detail below, human capital in an Information Society serves to deploy the technology efficiently, as well as to win competitive advantages in a knowledge-based economy. "E-Learning" instead, is about digitizing education systems. The goal is to support the education process by using information processing and communication facilitating technologies.

Of course, countless spillover effects exist between these two fields. "E-Learning" is a means (one between others) to an end, which is "human capital". As the Internet makes information and educational networks easier to access than ever, e-learning is an adequate, cost-effective and very sophisticated tool to support the training of human resources. The use of Information and Communication Technologies —given the definition of their utility (processing information and facilitating communication)— mutually reinforce each other by training human resources.

A distinction can be drawn between two basic arguments in the discussion about human capital in an Information Society:

The first one is the necessity for training about ICTs. Information and Communication Technologies are highly user dependent and often, the lack of user skills prohibits the full exploitation of the new technology. However, it is not only about understanding and handling ICT, but it is also necessary that people adapt the technology to their own needs and opportunities. This requires skills that enable people to master the technology. Considering the close relationship between content and software services, for example, and the frequent need to adapt a service tool to unique local content, it seems that a minimum level of domestic skills to innovate and modify software programs and content is indispensable to assure active participation in an Information Society. This is also true for a more "ICT usage-oriented" and less "ICT production-oriented" region, like Latin America and the Caribbean.

The second argument centers on the discussion about the increasing importance of tacit knowledge (see Section "Towards a Theory on the Information Society"). Tacit knowledge (namely skills, beliefs, habits, customs, etc.) gains weight in a world where codified knowledge (namely information, codified through data) is widely available through vast electronic networks. Human creativity and the often-praised "entrepreneur-spirit" needed to obtain a competitive advantage is becoming the center of attention. The discussion also includes the phenomenon that is known as "brain drain". This term implies that professionals with valuable tacit knowledge from the developing world are lured away by rich companies to put their skills into practice abroad. This leads to an increasing concentration of tacit knowledge in high-income countries and creates skill deficits in the developing world. While this process cannot be prohibited in a globalized world where an individual has the right to mobility, non-material incentives need to be found to motivate highly skilled professionals to stay.

Also, existing educational mechanisms are gaining importance given the new light of tacit knowledge that is shining in. Educational standards are relatively low in Latin America and the Caribbean. While countries in the region provide on average 6.1 years of schooling to their population (Brazil 4.9 years; Colombia 5.3 years; Venezuela 6.6 years; Mexico 7.2 years; Chile 7.6 years; Argentina 8.8 years), countries in Eastern Europe for example, provide on average 9.6 years of schooling (Hungary 9.1 years; Slovakia 9.3 years; Bulgaria 9.5 years; Czech Republic 9.5 years; Poland 9.8 years) (UNDP, 2001). The deficiencies are not only quantitative, but also qualitative. In the recent international comparative study on schooling outcomes of the OECD (Programme for International Student Assessment; PISA), the two countries included from Latin America and the Caribbean (Mexico and Brazil) came in last in all of the three categories examined (reading literacy, mathematical literacy and scientific literacy) (PISA, 2001). With regard to tertiary education, the situation in Latin America is even worse. The average public spending per student on tertiary education in Latin America as a percentage of GNP per capita is way below international average. While the average in the developing world in 1997 was 68%, public institutions in Latin America only spent 35% of their GNP per capita for a student (UNDP, 2001). These numbers show that greater attention needs to be paid to creating human capital in Latin America.

In addition to public spending, some countries in East Asia have found that relying on sources from industry and private companies for a large share of the spending as an adequate approach to finance education at the upper secondary and tertiary levels. Experience shows that the interest of the private sector in a well-equipped local workforce can be used to finance expensive tertiary education. In South Korea for example, private institutions accounted for 61% of enrolments in upper secondary education and 81% in tertiary education in 1993 (UNDP, 2001).

In the worldwide scenario, large-scale participation of the private industrial companies in advanced education and science is rather the rule than the exception. Among most OECD countries the private sector finances 50%-60% of research and development (UNDP, 2001). Latin America and the Caribbean, is an exception to this trend. There, the private sector undertakes only around 10% of research and development (with the notable exception of Brazil, where the private sector carries out 40%) (UNDP, 2001).

Integrating industry in academia and science, is not only important in means of financing, but also in order to keep up with the fast pace of development. As underlined in the following section about professional profiles, the study program of a telecommunications engineer has changed very dramatically over the past 20 years. It is not possible for the public sector by itself to keep up with these changes and to constantly update the curriculum adequately. Public-private sector collaboration in tertiary education is indispensable in order to provide updated content at an affordable price.

In Finland for example, 40% of the companies have collaboration agreements with universities, especially in the field of ICTs (OECD, 2001). The 2001 UNDP Human Development Report cites the example of Tampere University of Technology in Finland (UNDP, 2001a). It links up the Technical Research Center of Finland with Nokia and firms in the wood processing industry. Industrialists in science and technology spend 20% of their time at universities, holding lectures to students in their areas of expertise. The "adjunct professors" work on a challenging interface between industry and academia, and students learn the relevance of technology for industry (Jones-Evans, 2000). This kind of cooperation (which is very similar to the German "apprenticeship model") would make the expensive task of constant schedule updates affordable for developing countries.

Companies need to be encouraged not only to train their future workforce, but also their current staff. This is especially necessary to ensure technology is correctly used. In spite of the increasing importance of "lifelong-learning" in a fast changing working environment, "on-the-job training" provided by firms in Latin America and the Caribbean is still neglected. For example in 1994, only 11% of Mexican enterprises provided formal and informal training for their workforce, while 83% of Malaysian companies provided informal and 35% formal training (Tan and Batra, 1995).

Despite the current deficits in the region, the idea of creating "Human Capital" for development —besides accumulating physical and financial capital— is not new to Latin America and the Caribbean. Particularly in the region, the era of "industrialization through import substitution" focused economic policy on training the workforce. As a result, governments set up several agencies to support the training of the national workforce at this point in time. Initiatives like SENAI in Brazil (Serviço Nacional de Aprendizagem Industrial), SENCE in Chile (Servicio Nacional de Capacitación y Empleo), the National Directory of Employment and Training policies in Argentina or SENA in Colombia (Servicio Nacional de Aprendizaje), among others, were all created to support development of human capital (Cárdenas, 2001). Over the decades they became powerful and recognized organizations in their respective countries, and receive a considerable annual budget. However, they are ill-equipped to meet the demanding challenges of a workforce in the Information Society and would require profound overhauling. SENA in Colombia, for example, allocates less than 20% of its resources to technological innovation programs (Cárdenas, 2001). Making these agencies function to their full capacity of creating an adequate workforce for the Information Society could be a powerful policy.

An adequately trained workforce is not only needed to run domestic industries. The global digital network infrastructure and the "death of distance" with regard to digital goods (see Section "Towards a Theory on the Information Society") also enables developing countries to create entirely new industries. The idea is to use the digital network to provide labor-intensive digital products and services worldwide, at a low cost (ILO, 2001). The provision of digital products and services is only restricted by bandwidth and not by geographic distance. Low labor costs and a well-educated workforce can create a service industry, where tele-workers —who are predominantly women (ILO, 2001)— sell their knowledge worldwide. For example, 185 of the Fortune 500 companies outsourced their software requirements in India alone in 2000 (UNDP, 2001).

The first step towards creating human capital to serve an Information Society is to identify which kinds of workforce profiles an Information Society in Latin America and the Caribbean demand. Up to now, little is known about the adequate profile of a professional in an Information Society. Less is known about which sorts of professional profiles would be required by an Information Society in Latin America and the Caribbean. The following section takes a look at the evolution of professional profiles and at several alternative future scenarios.

2. Technical profiles[44]

The degree of knowledge required by the information society, as well as the associated academic levels and the more practical or theoretical nature of the education or training needed vary widely in the different

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[44] This section is a contribution of Mr. Gonzalo León, Professor of Telematics Engineering, Universidad Politécnica de Madrid. Many of the ideas expressed in this article originate and have developed from the discussions of the working group and the results obtained in a study referred to as PAFET. PAFET was carried out with the sponsorship of ANIEL and the College of Telecommunications Engineers in Spain during 2001, as well as the participation of some of the components of the working group in one of the working groups of the Career-Space project.

professional profiles used by the organizations and persons involved (Vickery and Wurzburg, 1996). Professional profiles are understood as sets of skills and types of knowledge needed to carry out a particular task in an organization. Professional profiles are not static. Every year new needs emerge, whether brought about by technological developments related to ICTs or by their mass integration into society. Those needs require new skills, and, in some cases, the development of new professional technical profiles, while some existing ones become obsolete (or are profoundly changed). This phenomenon, known as "skill mismatches" is becoming a large-scale problem as it affects large percentages of skilled manpower (regardless of professional or academic level) in various sectors of Latin America and the Caribbean (ECLAC, 2002b).

This panorama offers a twofold perspective of the situation of ICT professionals. There is currently a quantitative mismatch, and a qualitative mismatch in relation to the knowledge and attitudes that are needed in order to ensure the availability of suitable technical profiles for the needs of an information society.

In relation to quantitative needs, the growing demand for professionals for the information society in all areas of strong economic growth has manifested itself in two overlapping phenomena in Latin American countries. There is the pressure to have a sufficient number of ICT professionals, starting with the relatively low numbers now available, to meet the need to develop the information society. However this is hindered by an increase in the migratory flow of trained professionals to other countries outside the region, thereby reducing their local availability ("brain drain"). The second phenomenon, that of professionals being received by other countries, is well known in Spain, and implicitly encouraged by double nationality procedures, as well as other countries of the European Union and the United States. This has increased the number of residence permits available for this type of professional (H1B visas or green cards). The phenomenon becomes very serious if not accompanied by a gradual return of such professionals to their countries of origin (which seems to be partially taking place). The quantitative needs for ICT personnel qualified in the sectors of information and communication technologies vary significantly with different economic circumstances. Over the next few years it seems that those needs in the sector-generating technologies and services will experience a lesser rate of expansion. Although needs may continue growing in the user sectors. This situation will be common to all countries.

In relation to qualitative mismatches, a model for professional profiles that indicates the relevant elements is apparent. The model provides a basis for the definition of foreseeable scenarios which should be compared in each of the countries. Lastly, consequences and recommendations are developed from the political point of view which could be applied in Latin America in view of the existing situation in the region.

(a) The concept of professional profile

Although, all citizens of an Information Society should have to possess a minimum set of ICT skills to allow them to actively participate and control the development of those societies, naturally some professionals will assume a much more significant and active role than others. Such persons are referred to as "information and communication technology (ICT) professionals".

A key element which will be referred to in detail is the obsolescence of current professional profiles. Firstly, there is the need to update the required technical skills, associated with a profile that technological development demands. In this case, it is not that the profile disappears but rather that the generic objectives covered by the professional who has that profile will be carried out through new activities, or that the activities will be carried out in a different way. In some cases, the profile may be derived from a separation of some tasks that were previously part of another existing profile. In other cases, one profile is substituted by another as a result of the disappearance or lack of interest in the tasks associated with the profile, perhaps because they have become technologically or socially obsolete. In some cases, there may be a merging of the two profiles.

Any job profile may be described in greater or lesser detail, and may be valid for a small number of activities or for a larger number of activities depending on the details in the job descriptions of the skills required. From an educational point of view, there are three categories of profiles (referring here to technical profiles only):

- Generic profile. Usually obtained by graduating from an academic institute (university level or professional training);
- Derived profile. Postgraduate studies related to a specialization with enhanced greater knowledge of practical aspects;
- Specialist profile. Refers to the profile needed for a specific post which includes all of the necessary contextual information.

The main responsibility for providing generic profiles falls on the educational institutions. However, these profiles are far from all the requirements needed for employment. Derived profiles may be provided by public and private institutions, usually by means of postgraduate studies. Lastly, the specialist profiles should be generated by the enterprises themselves.

A technical professional working with ICTs who works in a specific institution has a special profile associated with the particular post concerned. That point has been reached by means of a process of specialization that required a certain amount of time, based on generic and derived profiles obtained previously. Those profiles (assuming that they remain valid) act as a "reserve" to be used in other employment in the future, after the relevant processes of specialization.

It is not easy to associate the name of an academic degree with a specific professional profile. For example, two telecommunications engineers who graduated from the same university with a 10-year time interval between them studied curricula that differ by 25% in their content. If the time interval is twenty years, the curricular change will be more than 50%. In such cases: are we speaking of the same professionals, although they have the same academic degree? Clearly, a more detailed analysis is needed in accordance with existing specific skills and competencies.

As already mentioned in previous chapters in relation to the focus of a country's strategy, there are also two different focuses for the development of "human capital". Various studies carried out by the European Union show that the two groups of profile types are as follows:

- Those needed for developing technology, such as the design of components, networks and Internet-based applications or for mobile equipment: and
- Those needed to make use of technology, such as network administration, solution integration, telecommunications consultancy, etc., which combine a general technical knowledge relating to the needs of specific socioeconomic sectors, organizations and users.

The interaction between these two types of professionals will make it possible to ensure that the infrastructures of information and communication technologies are sufficiently flexible to adapt rapidly to the changing needs of users. They thus become prerequisites for the consolidation of the information society.

Coming down to a more specific level, it is interesting to analyze how the technical profiles related to ICTs have evolved over time. The first phase can be described as a set of profiles highly connected with technology. In these, the control of equipment and control of software has been the fundamental element. The introduction of information technology and, subsequently, of telematics in many sectors has introduced many other profiles related to solving user problems. This second phase, however, has included the profiles of the previous ones while complementing them with additional ones. Lastly, the third stage —which is when information society technologies have penetrated to all economic and social sectors— requires professional profiles, in addition to those previously mentioned, that facilitate innovation processes in all sectors.

(b) Scenarios 2001-2006

On the basis of the situation described above, there would seem to be an accelerated process of change in the professional profiles needed, in which many of the basic variables are going to change in magnitude and direction (herewith referred to as indicators of change). What is less obvious is the path that will consequently be taken by the pool of professional profiles.

The three scenarios selected refer to the position of ICT profiles in the year 2006. This period is sufficiently far ahead in time to not be limited by the present situation, yet is not so far ahead that technological development is difficult to predict. In brief, the scenarios selected are highly specialized profiles, multi-purpose profiles and hidden profiles. The scenarios selected are not entirely incompatible. In some sub-sectors one of the profiles may be used and in other subsectors another may be used. In any case, they define the main trends which should be analyzed. The analysis should be specific for each country taking the context into account.

Highly specialized profiles

In this case, it is assumed that the development of the technology associated with ICTs accelerates, leading to the creation of commercial products with shorter life cycles. Their introduction into society means that their complexity is directly perceived by a growing number of users.

In this scenario it is assumed that the rapid evolution of technology makes it essential to have experts with higher levels of specialization than at present. These "super-experts" are avidly sought after by companies in the ICT sector who want to employ them for short periods to develop new products and by user companies that wish to take advantage of them in their user environment.

This process of expansion of specialization leads to the continuous appearance of new professional profiles. Such profiles, on the other hand, have shorter useful life cycles. They are almost never stable as the associated competencies are constantly changing, without leaving time for generating new professions. The obsolescence of knowledge hangs like a sword of Damocles over the heads of the professionals who, urged on by competition, by their companies, and by the possibility of losing their place in the job market, make higher levels of personal effort in self-training in very specific areas of interest in the job market.

In this scenario, educational institutions, even more so than now, are also considered "obsolete", so that companies, or groups of companies, in some cases through agreements with educational institutions, try to resolve the problem. Another consequence is a destabilization of the educational system as we know it. There will be more pressure for official recognition of professional knowledge related to high degrees of specialization.

Scenario for multi-purpose profiles

In this scenario, the number of companies that develop and investigate new products or processes remains very limited. The country becomes consolidated mainly as a country of services in which companies primarily need to be able to identify, evaluate, incorporate and integrate new technology. The diversification of activities, in the search for market niches and opportunities, is speeding up, and professionals are needed who know how to adapt to the use and integration of new products and technologies. But it is not clear what the latter will be. There is a need to be ready to incorporate new technologies, of which it is not possible or necessary to have a complete knowledge at a given moment in time.

In this scenario, companies value the availability of professionals who are capable of learning on their own, with a good foundation, and with a broad vision of problems and solutions.

The consequence for professional profiles is a strong valuation of generic profiles. A high degree of specialization is not required as the design of products is a marginal, or at least, very restricted, activity; the companies that need to do so can easily meet their requirements through their systems of internal training related to the job. Also, the globalization of research and development activities and mergers of companies have in any case made it possible to have access to the development of products and experts in any other country.

The teaching for these generic profiles is mainly based on the public system which also receives a lot of attention from the private sector in order to ensure high quality of the training provided. The private sector should also send messages which reorient the teaching towards the interests of business sectors, though without excessive involvement in the teaching itself.

It is precisely this broader vision that is sought after and appreciated by current professionals in order to complement what they already have. Thus, postgraduate degrees in company management, microeconomics, rudiments of telecommunications law etc., become a key element in the further education of employees and employers. What is sought is an extension of knowledge horizontally and not in depth. Companies, in any case, take on the necessary training in the profiles related to the job, and hence there are less derived profiles.

Hidden profiles scenario

The function of selecting and utilizing sophisticated products and services related to the information society should not reside exclusively with professionals who are specifically trained in ICTs. All existing professionals should become competent in different areas of ICTs, which will help them to make greater use of their potential in their specific field of work.

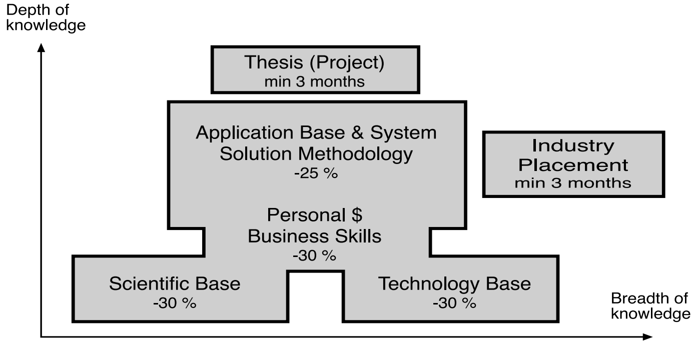
Companies are beginning to see that the shortage of ICT professionals can be resolved by using their own employees, who are more familiar with the problems to be solved, and who also view the acquisition of such knowledge as increasing their professional value. Companies and professionals seek training in order to complement what they already have with specific knowledge relating to ICTs. For this purpose, they offer many courses (many of them on-line) aimed at specific professionals. The public education system focuses on the generation of ICT lawyers, ICT doctors, ICT economists, etc. as a means of resolving apparent needs. There are therefore hidden ICT profiles in many professional communities. This does not mean that specialist ICT profiles are not needed, but an increase in these profiles is no longer urgent. Their use is limited to the core of companies that generate ICT products, and their number remains very small.

Influence on the educational system

Educational institutions have not been unaffected by the very rapid development described in the scenarios presented above. In some cases on their own initiative they have begun to ask themselves how they can deal with the new needs. In others, unlike in many previous situations, this questioning has resulted from pressure from and initiatives of business sectors.

One of the initiatives worth mentioning is the one associated with the project “Career-Space” (ICEL, 2001). This initiative, supported by a group of large companies,[45] has defined a set of technical profile areas (limited at present to 13) which they require for their own activities, as well as the general structure of the curriculum that the universities should adopt in order to meet those requirements (www.career-space.com). A first analysis of the curricular structure proposed indicates that it advocates a very broad generalist base, restricting specialization to the final phases. Personal skills are included by incorporating periods of placement in companies.

CURRICULUM MODEL PROPOSED IN THE "CAREER-SPACE" PROJECT



This is not the only initiative. In the United States, a new task force consisting of the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM) has launched an updated version of the "computing curriculum" of 1991 (Steelman, 2001). Some 10 years later, the contents and structure of the current curriculum required an in-depth revision.

(c) Continuous training adjustments

The need to adapt the knowledge of existing professionals will grow and will require a continuous effort from companies, academic institutions and the professionals themselves with encouragement by their governments to keep training programs ongoing. The knowledge currently taught for university degrees and diplomas related to ICTs does not cover the needs expressed by the companies in the sector (mainly in the personal skills

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45 Although the number may vary, at present it is supported by the European Commission and consists of the following companies: Thales, IBM, Microsoft, BT, CISCO, Intel, Nortel, Telefónica, Philips, Siemens, Nokia, EICTA (European Information and Communications Technology Industry Association). They are all generators of technology, and hence their perspective considers technical profiles for development only and not for technology users.

required but also in the need to deal with new ways of providing the training). The profiles obtained will need to be increased. The effort made in the Career-Space project to define 13 profile areas, required for a set of companies (a number which can be expected to expand), and the establishment of these profiles in collaboration with the academic institutions, indicates one of the paths towards updating knowledge which should be taken in the future.

The very fast evolution of ICTs and the sectors in which they are applied will require multi-purpose professionals capable of adapting themselves to changing environments. A good basic training will be required and there will be a need for continuous training adjustments. This situation implies that the authorities of Latin American countries must act rapidly and also define the action that can be taken to increase the availability of professionals.

Regulatory incentives

The development of specific regulations is an appropriate action with two basic objectives: to promote actions from the private sector and the public sector in a particular direction and to establish the framework in which this can be developed.

- Attention to adult education, with a definition of the minimum curricular content needed for the information society;
- Establishment of knowledge requirements relating to the use of technologies for the information society to enable access to jobs in public administrations. This will make it possible to increase valuation of such knowledge and promote its use, thus increasing the catalytic nature of public administrations;
- Reduction of taxes for companies or for their employees on their annual investment statements in aspects related to training in and for the information society. Such a reduction would encourage all employees to take courses and to have a minimum level of annual training in these technologies;
- Facilitate the migration of qualified manpower among countries of the region by maintaining the social rights relating to the country of origin, and avoiding an excessive brain drain by establishing annual quotas and return programs;
- Promote updating of curricula, by educational institutions involved in implementing them in an autonomous way, for the effective integration of ICT-related content at all educational levels.

Support for cooperation in training

Adjusting supply and demand to identify the professional profiles required, implies the need for shared responsibility among educational institutions, companies and public administrations. It is proposed that support measures be established between companies and educational agencies for the development of customized training programs, recommending:

- Adaptation of curricular contents, both in secondary education and at the university level, so that all degrees and diplomas have a minimum number of credits, with participation from companies that indicate their needs;
- Establishment of a strategy to define a system of common curricular content in university degrees and diplomas related to technologies for the information society for all countries in the region in order to facilitate mobility and the subsequent recognition of such degrees;
- Attention to the needs of specific profiles previously identified, through the development of joint programs with companies in the region and training of trainers when necessary;
- Improvement of the region's reputation as an outsourcing destination for development companies from outside the region.[46] The availability of reliable broad-band communications will facilitate this scheme, supported by the basic training of the relevant university population.

Exchange of information

Lastly, with the aim of developing a coherent policy for action in the region, two types of measures are proposed:

- Regular meetings of those responsible for education and professional training related to the information society of all Latin American countries to exchange experiences and to evaluate joint action;
- Facilitate the availability of updated information on needs that

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[46] This strategy could be based on the model used in India (and especially in the case of software for the region of Bangalore) in which a large number of multinational companies use the recognized capacity of existing qualified professionals. Software requirements are outsourced in India by 185 of the Fortune 500 companies (UNDP, 2001).

may arise, by creating a permanent regional observatory of needs for professional profiles related to the information society;

- Lastly, it would be useful for each of the countries in the region to establish a set of indicators with medium- or long-term strategic objectives, defined in such a way as to allow adequate follow-up of the measures included. It would also be appropriate for these actions to be included in a more general development plan for the information society.

Chapter IV

Vertical sectors in Latin America and the Caribbean

Vertical Sectors, as the final dimension of the three-dimensional conceptual framework, represent the process of digitization in an Information Society. They are based on sector-specific intermediation and fulfillment functions of digital activity (see Section "Towards a Theory on the Information Society"). Unlike the Horizontal Layers (Infrastructure and Generic Services), the focus in the Vertical Sectors is not so much on digital products, but rather on digital processes. By digitizing information flows, communication processes and coordination mechanisms in different sectors of society, an advanced form of organization is introduced. This constitutes an institutional reorganization, which moves the functionality of the sector into the "digital age". The fact that part of the information flows and communication processes are taking place through electronic networks in the different sectors, is usually emphasized in literature by adding an "e-" in front of the word.

Digital activity through electronic networks brings special characteristics with it. One of them stems from the existence of "network externalities"[1] (Shapiro and Varian, 1999). The process of digitization is not

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1 Network externalities arise for a product for which the utility that a user derives from consumption of the good, increases with the number of other agents consuming the good. The value of a network increases through the function (X^2-X), with every additional X users connected to the network.

an individual process. Network models only make sense if they have a minimum "critical mass" of participants. The usefulness of a subscription to a network is higher when the network embraces more subscribers. Once the "critical mass" of subscribers is reached, network externalities accelerate the process of adaptation, leading to a herd effect, which forces all to either integrate themselves (in this case to "digitize") or be left behind.

Besides this "adaptation herd-effect", the scale itself, or amount of users, is paramount in digital practices. Digits have almost infinite economies of scale. They are non-rival, meaning that they cannot be "used up" (Negroponte, 1995; Kelly, 1998). An important factor in explaining the behavior and functionality in Vertical Sectors is therefore the existence of digital goods and the differentiation between digital and non-digital goods (see Section "Towards a Theory on the Information Society"). Not everything can be digitized. However, the production of digital goods is almost 100% fixed cost. The cost of duplication is almost zero. Their distribution is only restricted by bandwidth and infrastructure access, not by geographic location ("death of distance"). While both non-rivalry and death of distance are characteristics of digital goods, digital services only comply with the second characteristic. Often, the final performance in a Vertical Sector is a mixture of digital goods, digital services (before or after-sale services, payment procedures, advisory and consultancy services, etc) and non-digital goods and services.[2] By digitizing part, if not all, of the performance, economies of scale and scope in digital goods and services are exploited in order to satisfy a broader demand. Since the variable cost component for duplicating digital information is almost zero, reaching scale becomes the key for increasing returns to investment in Vertical Sectors.

Advances in the Generic Service Layer also permit economies of scope in information management. The fixed-cost investment in software might be tremendous. However whether the software is for managing information of millions of users or only a few within the system makes little difference to costs. This applies to e-government service tools, as well as to e-learning systems, e-commerce supply chains, e-health databases, etc. Theoretically, this notion of costs can be explained with the transaction-cost theory (Coase, 1960; Williamson, 1979), which states that for coordination processes, with an increasing number of internal transactions, decreasing

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[2] For example in the e-health sector, prevention and pre-examination mechanisms can be digitized, as well as consultation, payment and many post treatment services. However the physical treatment cannot be digitized. The same goes for e-commerce models like Amazon.com, which are digitizing part of their business model, etc.

organizational costs to scale can be expected. Considering the high fixed-cost of digital service programs,[3] scale is paramount for cost-effective information management systems. Economies of scope in information management and economies of scale for digital goods might also lead to a process of tremendous market concentration, as for example seen in the multimedia industry (see Section "e-Media").

By combining the existence of network effects, with the unlimited economies of scale for digital goods (non-rivalry) and economies of scope in information management systems, it becomes obvious why Vertical Sectors are often characterized by classic "chicken-and-egg" scenarios regarding their usage and benefit. In other words users will not go online, as long there is inadequate content. At the same time, as long as there are not enough users content will not be produced. The success or failure of e-practices highly depends on reaching scale. Only when active participation in electronic networks reaches a "critical mass", can the vicious circle between usage and benefit be overcome and lead to a virtuous circle of ongoing expansion.[4] While this is not as decisive a factor for large countries, like Brazil and Mexico which reach sufficient scale with relatively low Internet penetration rates, small counties in particular need to reach relatively high Internet user rates in order to kick-off local content creation in the Vertical Sectors.

There are many different "e-Sectors". The omnipresence of the economy puts "e-business" or "e-commerce" into the center of most analyses. However, other sectors can greatly benefit from digitization. "e-health" holds great promise for improving performance in the health sector, which is an urgent task in developing countries. "e-government" can create greater transparency and efficiency in public administration. "e-learning" promises to ensure better results at cheaper costs in educational practices. In the end, many different Vertical Sectors can be identified. In this book, six of them have been chosen, given the advanced stage of their progress and their relevance for developing countries (e-business, e-government, e-health, e-culture, e-learning, e-media). However, it is important to repeat that this list is not exhaustive.

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[3] In the last quarter of 2001 a world-class ERP solution, for example (see Section "Generic Services"), ranks from US$ 100,000 to US$ 2,000,000. Those figures are not counting the implementation and labor training costs.

[4] With an overall Internet connectivity of around 6.0% in 2001, only some very specific areas of Latin America and the Caribbean had reached the "critical mass" in Internet usage by that year. This was seen in areas such as online banking or tax-paying in Brazil and Chile (see Section "e-commerce" and «e-government»).

Besides the sectors selected, an area that is often mentioned that can greatly benefit from digitization is “e-democracy”, for example, or what is sometimes referred to as “e-governance”. This concept goes beyond the dimension of e-administration of public services and is expected to change both how citizens relate to their governments and how citizens relate to each other (IADB, 2001). The concept of e-democracy is intended to broaden political participation by enabling citizens to connect with one another and with their political representatives through ICTs. However, development of the concept is still in its infancy. What can be observed up to now is, on the one hand, the increasing digitization of public administration (see Section “e-Government”) and, on the other hand, the social impact of ICTs (see Section “e-Culture”). It is expected that over time, a new political culture will be created based on interactive participation of the people. The conception of participatory democratic mechanisms would change the way representative democracy is understood today. Some claim that the capacity to link citizens to their representatives, irrespective of distance or space, offers the opportunity to strengthen the conditions that lead to democratic representation. Others claim that the concept of democratic representation will rather loose importance, as “networked” citizens participate more directly in the democratic process. One way or the other, as the processes of democracy and governance are increasingly digitized, the very concepts will need to be profoundly reevaluated.

As opposed to the incipient development of e-democracy, one Vertical Sector with a longer history is “e-security”. The use of security electronic networks has become a basic necessity in many museums, shopping centers, public buildings, companies and private homes. Police and firefighters are increasingly relying on extensive digital networks in order to increase their speed and scope of information. With issues like security, where a matter of seconds can decide between life and death, real-time communication is a powerful tool. Many environmental groups and first-aid organizations emphasize the importance of using environmental alert information systems, in order to minimize damage from environmental disasters. Recent experiences in Central America and the Caribbean show the great potential of such networks (ITU, 2001b).

Other popular Vertical Sectors are “e-payment” and “e-banking”. These terms refer to the digitization of payment and banking mechanisms, respectively. They deal with issues , ranging from credit cards and smart cards, to electronic stock trading and ATM machines, and mobile payment systems, which implies using digital mobile phones as a direct link to a bank account or other kinds of money deposits. E-payment is an important part of e-commerce (see following Section “e-Business”).

Digital networks can also be used to boost the tourism industry, which many developing countries depend heavily on (UNCTAD). Initiatives to increase tourism traffic by using the worldwide network include the establishment of extensive WebSites, and the complete vertical integration of everything from flight arrangements and hotel bookings to legal advice and even virtual "pre-trips" to some of the local attractions. Digital networks can also help to bypass expensive intermediaries and to strengthen the local industry. Digitizing information and communication mechanisms in the tourism sector could be called "e-tourism".

Furthermore, the scientific and academic sectors can largely benefit from digitization. New ways of academic and scientific cooperation over electronic networks have led to a concept which could be termed as "e-research and development" (e-R&D). The Internet makes setting up research networks easier than ever before. Information can be exchanged in real-time and countless GroupWare services (such as co-authoring or monitor sharing programs, videoconferences, etc.) are bridging geographic distance between scientists and establishing a global research community. This gives developing countries the chance to better integrate themselves into the "global exchange of ideas" (see Section "Towards a Theory on the Information Society"). Between 1995 and 1997 Brazilian scientists co-wrote articles with scientists from 114 different countries, whereas between 1986 and 1988 they co-wrote articles with only 70 countries (UNDP, 2001). Digital networks surely contributed decisively to this trend. One concrete example of best-practices in e-R&D is the electronic cooperation involved in the genome sequencing of a bacterium that attacks orange trees, discovered by Brazilian biologists in 2000. It was the first time that a free-living plant pathogen had been sequenced and brought important savings for orange farmers all over the world.

The list of "e-Sectors" is long. However, as one last example in this ongoing list of Vertical Sectors, it is worthwhile going back to the roots of the Internet. The original idea behind interconnected electronic networks like the Internet was to benefit from their decentralized organization in the case of war. Extensive information and communication systems have always been a decisive part in military coordination and warfare. Driven by tremendous military spending in the U.S., the area that could be termed as "e-military" is gaining importance in army operations. Recent examples of ICT usage in conflict situations show the power of this sector.[5]

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5 The possibility of minimizing casualties through precise operations and real-time communication is an argument often-mentioned in favor of extensive ICT employment in military operations.

A. E-Business

The process of digitization is most advanced in the economy. The idea of using electronic networks to facilitate business processes has been around since the early days of "Internetting" in the 1970s. Nowadays, the concept of digitizing information flows, communication processes and coordination mechanisms in business activities is known as "e-business".

The following Section takes a closer look at digitization in business activities. It starts with a brief introduction to the transition from Industrial Economics to Digital Economics (see also Hilbert, 2001b). In the second part of the section it takes detailed stock of the state of e-commerce development in Latin America and the Caribbean. In the same way that "commerce" is part of business activity, e-commerce is part of e-business. The term "e-business" stands for all strategic and operative aspects of economic trade through electronic networks, including inner-firm processes such as human resources coordination, planning and controlling mechanisms, as well as EDI[6] and other forms of electronic trade. The term "e-commerce" does not include the digitization of the productive system and exclusively focuses on operative processes between a provider and its client through electronic networks (in its definition mostly limited to transactions through the open Internet).

1. Digital Economics

From the point of view of the individual firm, the process of digitization of information and communication mechanisms in the business sector is mainly driven by two simple factors: cost saving and increased efficiency. Digitization helps to rationalize and unify existing communication systems and additionally augment valuable information flows. It supports faster and more complete coordination of business processes and increases their reach. This includes both processes inside a firm and transactions or communication between different trading partners and collaborators.

6 EDI (electronic data interchange) systems are often proprietary networks and maintain their own internal systems based on a set of contractual agreements. They have been developed by large companies who were early adopters of the technology, capable of making the necessary economic investment and able to prove the business case for the technology. Meanwhile EDI networks are standardized and the interconnection of the networks extended the scope of EDI globally. In comparison to Web-based transactions on the "open" Internet, "closed" EDI systems are considered to be more secure and less liable to fraud.

Digitizing business often starts with email communication for information and coordination purposes. More than 70% of Latin American companies (excluding micro-enterprises) already use email to help coordinate their business activity (Hilbert, 2001a). The benefits of digital coordination (such as speed, reduced transaction costs, greater transparency, intelligent information management, etc.) lead to an expansive use of ICTs in many different areas of the company. The trend continuously creates new operative routines, which gradually get absorbed and integrated into the productive and organizational "culture" of the firm. This not only affects the behavior within the firm, but also the value chain that surrounds it, from raw material suppliers, all the way up to the final clients, as well as the technological and competitive regime that prevails in the sector.

Entrepreneurs make strategic use of the digital infrastructure to integrate inner-firm processes into an outer-firm network. In the course of searching for lower risks, as well as for the optimization of division of labor, enterprises create networks that communicate in real time over electronic infrastructure (see Box). Each part of the network pursues its own economic benefit, by taking advantage of horizontal and vertical cooperation, while the interdependence inside the network —mainly stemming from scarcity of resources— indirectly binds them together.

REAL-TIME COORDINATION THROUGH THE INTERCONNECTION OF DIGITAL SPREADSHEETS

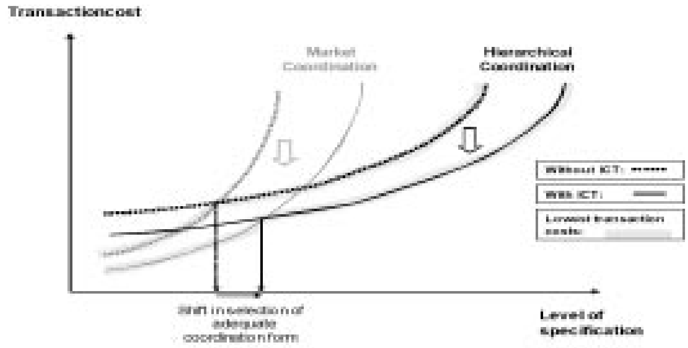
The new forms of cooperation and of administrative organization through digital networks are demonstrated by the speed of information exchanges inside and between companies. Such "real-time interaction" can be visualized by the concept and functionality of "spreadsheet programs". These programs, which can function as the 'real-time coordination platform' of a company, may look to the layman like tables with many rows and columns of "cells", similar to the widely used MS Excel worksheets. But their most important feature —how these cells are related to each other— is invisible. Often they are connected by simple operations such as addition or multiplication. More advanced applications, however, use sophisticated formulas, in which the cells are linked by dozens of 'macros', in some cases elaborate subprograms of multiple algorithms. If a user changes the data in one cell, many others are automatically recalculated. By interconnecting different spreadsheets of sorts in which new information (such as an order) is automatically processed and percolated through a firm's computer systems (from order-taking, to inventories of the sales division) and through those of its suppliers, a company advances toward integrated real-time coordination. Spreadsheet cells can also be linked to data sources (for instance corporate databases) while intelligent software on a server in the network ensures that this cell is automatically up-dated whenever the information changes. The interconnection of such coordination networks within and between companies, enables real-time economic interaction, thus smoothing out mismatches inside a company and the imbalances between demand and supply.

Source: L. Siegele; *The Economist,* February, 2002.

Reduced transaction-costs inside and between firms have an impact on the size and functionality of companies. Thus, new forms of cooperation and administrative organization are created. Outsourcing and virtual cooperation on the one hand, or vertical integration on the other, are two of the obvious results, which can economically be explained with the "transaction-cost theory" (Coase, 1960; Williamson, 1979) and the "principal agent theory", respectively (see Box).

HOW TRANSACTION-COSTS AND PRINCIPAL-AGENT RELATIONS RESHAPE THE ECONOMY

The transaction-cost theory proposes comparing the cost of the internal coordination cost with the one of market transactions for every business activity. As long as inner-firm coordination costs are less than market mechanisms, the corresponding transactions get internalized and the company integrates additional functions of the production process (for example by buying a supplier). On the other hand, if the costs of market mechanisms are lower, it could be profitable to externalize previously internal functions to the market (for example through outsourcing). Digitization of inner firm processes (e.g. ERP Software) and of market mechanisms (e.g. B2B marketplace) requires a reevaluation of transaction-costs. This has an impact on the size and functionality of the firm itself. For example, digital coordination through a B2B marketplace obviously reduces transaction costs (such as search and negotiation costs). Market transactions become cheaper. The company should become "leaner" and outsource some of its business activities to the market. On the other hand, hierarchical inner firm coordination should also become cheaper, through the implementation of workflow management applications. All in all, market coordination gains importance.



On the other hand, the principal-agent theory holds that information asymmetry inside a company leads to misunderstandings between the employer (principal) and the employee (agent). Such information asymmetry can end up being very expensive for the company. The implementation of an Enterprise Resource Planning application (ERP), Business Intelligence or workgroup management applications for human resource coordination, etc,

(continued)

How transaction-costs and principal-agent relations... (concluded)

support inner firm management processes. With the help of digital organization, information can be communicated through all different hierarchical levels in real-time and the centralization of data in huge databases reduces information asymmetry. With the help of ICTs, the principal is able to delegate its agent a lot better and a lot cheaper, which would imply the increasing importance of hierarchical coordination.

In this respect tremendous dynamics have recently been observed in many markets where the digitization of inner-firm processes and of inter-firm coordination already have had a decisive impact on transaction-costs and inner-firm management. A clear trend of these areas towards smaller or larger firms has so far not been identified. But it should be remembered that transaction costs and principal-agent relations surely differ between industries and markets.

Source: Martin R. Hilbert, based on F. Bodendorf, «Wirtschaftsinformatik im Dienstleistungsbereich» (http://www.wi2.uni-erlangen.de), 1999.

In summary, digitization of economic activity enables new business models to emerge along with new forms of cooperation and new coordination mechanisms within the economic incentive system. Particularly driven by huge and powerful multinational companies, a networked economy is being created, which is introducing significant changes in the functionality of markets and company behavior. This obviously brings about changes in micro-and mesoeconomic industrial organization.

Current economic literature lacks adequate theory to completely understand the nature of the dynamics of such an economy. The conventional neoclassical theory builds on the metaphor of the "representative firm", which transmits a very simple and stylistic image of the objectives and restrictions within which a company operates. The behavior of the firm is not affected by direct interdependencies with other productive agents. It becomes obvious that such a model of microeconomic and sectorial behavior serves little to explain the dynamics that are created by increasing interconnectivity between companies through digital networks. In the transition towards business models, it becomes clear that various forms of direct and indirect interdependencies in an increasingly networked economy require a more detailed examination on a microeconomic level.

Such business models include where suppliers automatically manage the inventories of their clients or where huge databases and intelligent information systems enable them to establish long-term contracts by providing customized performance to every individual client ("mass-customization"). Other models include where streamlined production procedures and coordination mechanisms take place worldwide in real-time at low cost. All these dynamics have created a vacuum in the economic profession. Impressed by the dynamics introduced by digital practices, some economists have declared the arrival of a "New Economy". It is said that old economic laws have ceased to be valid, and that new microeconomic organization will lead to a period of ongoing macroeconomic expansion. Testimony to this theory is the 1,000s of new firms that sprang up during the 1990s, which make extensive use of the Internet to create new business models. The entrepreneurs of such "Internet pure players" (with Amazon.com as perhaps the most famous example) understood very quickly that the digitization of communication and coordination processes was enabling them to obtain a temporary competitive advantage over their "old economy" counterparts.

After the initial phase of enthusiasm about the new possibilities, academics and companies alike have been forced into a sobering consolidation phase, forced upon them by the same powerful laws of macroeconomic business cycles which they had previously pronounced as "being dead". The burst of high-tech stock market bubbles in 2000 and the worldwide economic downturn of 2001 finally brought the "New Economy" down to earth. This turning point initiated a phase of serious and profound analyses of the characteristics and functionality of the "high-speed evolution" (Hilbert, 2001b) in which economic activity was progressing. Economists will have to recognize the laws of informatics, of communication and coordination mechanisms and the rules and dynamics of digital networks, while information workers will have to consider economic laws, in order to create and sustain valid businesses. A large amount of intensive scientific research is necessary to untangle and help to understand the functionality of the Digital Economy.

The central lesson to be learned from the hype about the "New Economy" might be that, while the process of digitization is hugely reshaping microeconomic organization and sectorial behavior of "companies", this is not an overnight process. Path-dependencies and their interdependency with their physical, social, cultural and industrial environment introduce a certain inertia into the process. While digital markets are highly effective and are widely accredited by the private sector for having significantly raised productivity in their companies, their effectiveness only started revealing itself once the technology had been embodied in the organizational structure of the business. It is not the number of computers that triggers higher productivity but rather the overall change in the way the economy works.

DIMENSIONS OF THE DIGITAL ECONOMY IN LATIN AMERICA

Numbers and figures about e-business and e-commerce volumes vary widely between different sources (as well as the definitions of the term e-commerce and e-business vary). It is estimated that worldwide e-commerce transactions in 2002 (including Web-based B2B and B2C) accounted for 3.0% of the global GDP (with B2B representing 86% of the total). The United States took the lion's share with 58% of global e-commerce. Estimates for e-commerce in developed countries show that Web-based online transactions in the United States, Japan and Europe should represent around 7.0%-15% of their respective GDPs in 2002.

In Latin America it is estimated that e-commerce transactions accounted for approximately 1.0% of the GDP in 2002 (US$ 20 billion of US$ 2 trillion). However (with growth rates between 80%-90% per year), Latin American e-commerce is among the fastest growing in the world (only Europe's e-commerce is expected to grow faster in the years to come). Total e-business trade, including closed EDI networks (electronic data interchange) and other electronic trade systems, is estimated to account for US$ 189 billion in Latin America in the same year (9.35% of GDP).

This makes it clear that the current focus of electronic business transactions in Latin America (as elsewhere in the world) does not lie in Web Portals and other open Web-based front-end interfaces. Some 90% of e-activity is taking place through transactions in the "back-office" of the productive systems in the region. However, while the entire Digital Economy is expected to extend its rapid growth, Web-based e-commerce is expected to catch up in relative terms. Nevertheless, it is not expected that many of the large companies in the region that have considerable investments in EDI networks will displace them by pure internet-based systems in the near future. Open cheap Internet exchanges rather offer a chance for small and medium sized organizational units to develop, given their low cost.

Source: Martin R. Hilbert, based on eMarketer, *Latin America Online: Demographics, Usage & e-Commerce,* October (http://www.emarketer.com;//www.emarketer.com/products/report.php?latin_am), 2002

During the transition from an industrial organization towards a digital organization of an economy (Hilbert, 2001a), three phases of adaptation can be identified (Hilbert, 2001b) (1) In the first phase of email communication and digital information gathering and dissemination, the Internet is used to complement existing communication channels. Business processes are increasingly being coordinated online, while their execution, or completion takes place offline. (2) In an advanced "stadium" of online activities, the first online transactions are made. At this second stage, ICTs are used on the operative level. Taking and making orders is the core process at this operative level. Goods and services are bought and sold over the Internet, while the business model itself stays untouched. The Internet is used as a complement to supply and distribution channels. (3) Online practices cause changes in business practices and demand the production process itself to adapt. Digital behavior leaves the operational level of the business and increasingly governs strategic planning and decision making. Digital information systems are used in order to support decision making with regard to sales planning, demand forecasts, company goals and setting of priorities. Through constant analysis of the key performance indicators and the simulation of different positive and negative scenarios to validate strategies before deploying them, individual planning and coordination with trading partners can be fine-tuned. This far-reaching information management is increasingly changing economic organization as a whole.

The three successive stages are incremental and do not displace each other. It is often difficult to draw a clear line between them. Generally speaking, Latin America and the Caribbean are currently situated between stage (1) and stage (2) in this transition from industrial economics to digital economics. Companies in the region are making increasing use of the digital infrastructure to coordinate their business activities, mainly through email. However, cases of Latin American and Caribbean companies that use digital systems for strategic planning and decision taking are still anecdotal and are only found in some subsidiaries of large multinational companies. The following section takes a closer look at the actual situation of digital trade and e-commerce in Latin America and the Caribbean.

2. E-Commerce[7]

The premise of using the Internet to trade is simple. The promise of benefits for the economic actors involved is simpler yet: speed, easy to use, convenience, cost-saving and efficiency. However, for most businesses, fully exploiting the benefits of the Internet has proven more complex, largely because doing so requires making fundamental changes to business relationships and practices which cannot and do not take place overnight.

(a) Barriers to e-Commerce

Barriers to e-commerce are found on the consumers' side and on the business side. On the consumers side, problems associated with poverty and income inequality limit the "target market" for Internet services to the top-income groups (see earlier Sections). Businesses face some of the same constraints as consumers in Latin America and the Caribbean, although the inability of incumbent telecommunications operators to meet the demand for lines, particularly for high-bandwidth solutions, presents a more serious obstacle for companies seeking to engage in e-business. A Harte-Hanks survey of more than 17,000 businesses across Latin America found that 35% had some form of "high-speed" Internet access (greater than 56 Kbps), with Mexican, Peruvian and Chilean firms leading the way.

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[7] This Section is a contribution of Noah Elkin, Senior Analyst of eMarketer, Inc.

BUSINESSES WITH INTERNET ACCESS >56 KBPS, BY COUNTRY, 2001

Mexico	42%
Peru	39%
Chile	37%
Regional Average	**35%**
Brazil	33%
Argentina	31%
Colombia	31%
Venezuela	27%
Ecuador	22%

Note: % of total businesses surveyed; 50 or more employees

In other words, 65% of Latin American companies still access the Internet via a traditional modem, which translates into frequently unreliable connections and slow transfer rates. This is one important reason why many firms have difficulties engaging in e-business. As could be expected, large corporations have the best "high-speed" connectivity rates. Meanwhile, small and medium-sized enterprises (SMEs) as well as home offices are lagging behind in broadband adoption. They will increasingly require more readily available, lower-cost broadband connections in order to remain competitive, particularly if they want to take advantage of application outsourcing opportunities.

Moreover, with the exception of Mercosur and, to a lesser extent, the Andean Pact, Latin America is characterized by a relative lack of intra-regional economic integration and, in many cases, variegated national markets wherein different regions or states represent a disproportionate share of a country's production and/or consumption (such as the states of Brazil's Southeast region). Intra-regional exports accounted for only 15.5% of total exports in 1999 (although the figures are considerably higher for most Mercosur nations) (ECLAC, 2000a). This figure is significant because studies have shown that e-commerce tends to follow existing trade flows.

Another important indicator of a country's potential for e-commerce is security concerns. Privacy laws, incomplete digital signature laws, security failures, missing electronic certificates, etc. can have a decisive effect on the use of new technologies. Security issues are at the center of the discussion. Recent studies show that the most frequent security concerns among Latin American companies were about viruses (74%), followed by "service denial" (24%), "failure of applications" (19%) and "data modification" (15%) (IDC Latin America, 2001).

(b) Market size and growth potential

Prospects for Delayed E-Commerce Expansion

Macroeconomic factors have and will continue to exercise a decisive impact on the performance of e-commerce markets in the region. Inasmuch as e-commerce tracks offline sales and existing trade flows, the performance of key industries will have a direct bearing on e-commerce. E-commerce is likely to be adversely affected by the global economic slowdown.[8] Given the uncertainties the region faces as a result of the deep seated crisis in Argentina, the e-commerce revenue forecasts of market research firms and consultancies must be approached and applied with renewed skepticism. This applies, not only to the optimistic projections released prior to 2000, but also to the more conservative estimates issued after Latin America's markets began to feel the full effects of the economic slowdown.

WILL TAKEOFF BE DELAYED?: REVENUE PROJECTIONS FOR ELECTRONIC COMMERCE IN LATIN AMERICA AND WORLDWIDE, 2001-05 (IN BILLIONS)

	2001	2002	2003	2004	2005
Latin America					
Emarketer	$ 9.63	$ 20.70	$ 39.12	$ 66.50	-
Forrester Research	$ 13.40	$ 29.60	$ 74.10	$ 188.80	-
Goldman Sachs	$ 6.00	$ 24.00	$ 53.00	$ 102.00	$ 164.0
International Data Corporation (IDC)	-	-	-	-	$ 79.00
Pyramid Research	$ 1.14	-	-	-	$ 108.4
United States					
EMarketer	$ 355.32	$ 557.08	$ 821.27	$1,137.17	-
Europe					
Emarketer	$ 68.89	$ 169.81	$ 415.97	$ 979.83	-
Asia Pacific (excl. Japan)					
EMarketer	$ 0.89	-	-	-	$ 30.0

Source: eMarketer, «The e-Latin America report» (http://www.emarketer.com/ereports/elatin_america/welcome.html), 2001; eMarketer, *Latin America Online: Demographics, Usage & e-Commerce,* (http://www.emarketer.com;http://www.emarketer.com/products/report.php?latin_am), October 2002; IDC (International Data Corporation, «eWorld 2001» (http://www.idc.com), 2001; Pyramid Research, «Latin America: Demand for Telecom Services Continues to Grow Despite Hard Times Ahead» (http://www.pyr.com), 2001; Forrester, «Helping Business Thrive of Technology Change», Forrester Research (http://www.forrester.com), 2000.

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8 At present, no study is available which analyzed the relationship between Macroeconomic behavior and e-commerce. Anecdotal evidence from Argentina suggests that online transactions (especially online banking) increase amid volatile macroeconomic performance, while other studies suggest that with increasing instability consumers make less online transactions.

On the other hand, modest increases in online consumer spending and a decline in investment inflows may be partially offset by the efficiency gains that businesses realize by digitizing parts or all of their operations. Of course, this scenario assumes that the economic climate will permit ongoing investment in ICTs. According to the International Data Corporation's "eWorld 2001" survey, which surveyed 1,300 companies in Argentina, Brazil, Colombia and Mexico in 2001, Latin American businesses spent 20.9% of their IT budgets on Internet-related initiatives in 2001, up from 16.2% the previous year (IDC, 2001). Companies in Mexico spent more on Internet initiatives than those in the other countries included in the IDC study, Argentina, Brazil and Colombia, no doubt due to the fact that Mexico has more multi-national companies than any other Latin American country and is on its way to becoming the largest recipient of FDI in the region.

On a sectorial basis, manufacturing in Latin America and the Caribbean will lead the way, with one-quarter of its IT budget being allocated to Internet plans. Firms in the banking, utilities, telecommunications and transportation sectors are also investing heavily in e-business projects. Latin American countries may benefit if they can begin to substitute information-based products and services (such as data processing and software development) for reliance on beleaguered commodity exports.

B2B vs. B2C

Although consumer e-commerce tends to garner more publicity than business-to-business (B2B) transactions, the business-to-consumer (B2C) segment actually represents a small and shrinking share of Latin America's total e-commerce revenues. Most research firms believe that the B2B segment will generate the great majority of e-commerce revenues in Latin America and the Caribbean, given that businesses selling directly to each other or transacting via electronic marketplaces and exchanges will be buying and selling in far greater quantities and with greater regularity than the average consumer. Pyramid Research, for example, believes that B2B will account for 98%-99% of total e-commerce revenues by the middle of this decade. IDC estimates that e-commerce revenues totaled US$ 5 billion in 2000 and will grow at a rate of 68% per year until 2005, when revenues will reach nearly US$ 79 billion, with B2B accounting for around 90% of that total.

EXPOSURE TO RECESSION: REVENUE PROJECTIONS FOR B2C AND B2B E-COMMERCE IN LATIN AMERICA, 2001-2005 (IN BILLION US$)

	2001	2002	2003	2004	2005
B2C					
Accenture/ BSCH	-	4.60	8.00	-	-
EMarketer	1.76	3.31	5.49	8.11	-
Forrester Research	0.95	2.10	5.25	13.40	-
Pyramid Research	0.23	-	-	-	1.08
B2B					
EMarketer	7.87	17.39	33.63	58.39	-
Forrester Research	12.40	27.50	68.77	175.43	-
Goldman Sachs	3.50	14.20	31.80	61.10	98.50
Pyramid Research	1.12	-	-	-	107.32
Yankee Group	10.90	17.60	28.50	44.30	63.80

Note: Goldman Sachs figures do not include Mexico

Source: eMarketer, «The e-Latin America report» (http://www.emarketer.com/ereports/elatin_america/welcome.html), 2001; Pyramid Research, «Latin America: Demand for Telecom Services Continues to Grow Despite Hard Times Ahead» (http://www.pyr.com), 2001; Forrester, «Helping Business Thrive of Technology Change», Forrester Research (http://www.forrester.com), 2000.

According to IDC (2001), businesses in Argentina, Brazil, Colombia and Mexico attributed 1.6% of their revenues to the Internet in 2000.[9] For 2001, the companies surveyed expected that figure to nearly triple to 4.5%. The growth rate should be steepest among Mexican businesses, which anticipate Internet-related revenues as a percentage of sales to rise from 3.6% in 2000 to 10.5% in 2001, with firms in the banking, manufacturing, transportation, telecommunications and utilities sectors expecting to attribute 12%+ of revenues to Internet-related sales in 2001. By comparison, the figures for Brazil in 2000 and 2001 were 2.4% and 5.6%, respectively. The rising influx of foreign investment and Mexico's close trade ties with the United States, particularly in the manufacturing sector, may explain why IDC expected Mexico to make such a great leap forward in 2001. However, we must also keep in mind that the buoyant predictions for Mexico are based in part on the premise of a healthy United States economy. In a period of slowing or negative growth, Mexico's reliance on trade with the United States may turn out to be a disadvantage.

[9] Note that revenue "attributable" to the Internet, which may include sales facilitated in some fashion by the Internet (but not necessarily completed online), is different from actual e-commerce revenue.

Small and Medium-Sized Enterprises

While several studies indicate that large companies also have significantly more Web-Pages than SMEs (CCS, 2001), in terms of online transactions SMEs do not lag behind at all. In Chile currently, 37% of small and 84.9% of medium-sized enterprises are connected to the Internet (Subsecretaria de Economia, 2002). A total of 32.5% of Chilean SMEs that sustain online relationships with their supplier buy online (25.7% of the small— and 34.3% of the medium-sized enterprises). In terms of total commerce, the share that e-commerce represents is still small (less than 10%). However, considering that electronic business just started making significant advances three years ago, these numbers are impressive (Hilbert, 2002).

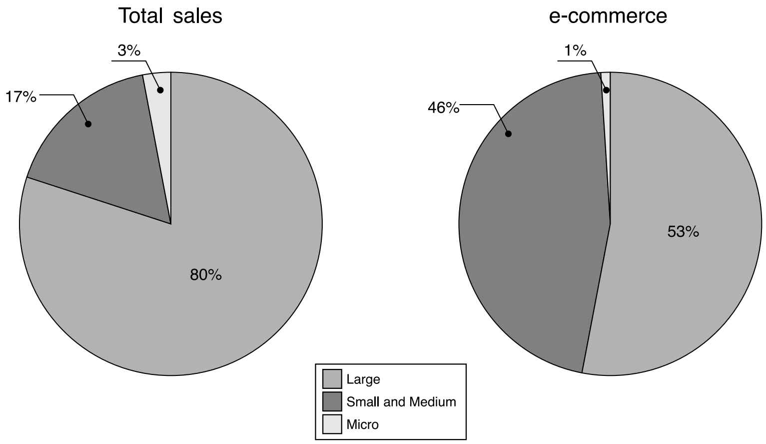
ONLINE ACTIVITIES OF CHILEAN COMPANIES IN PERCENTAGE

Size	Internet	% of companies with Internet supplier relations that quote prices online	% of companies with Internet supplier relations that buy online
Small	37.0	52.5	25.7
Medium	84.9	59.8	34.3
Large	92.6	66.6	30.5
Total companies	**43.6**	**55.2**	**27.8**

Source: Based on Subsecretaria de Economía de Chile, August, 2002.

While in proportion to total commerce in Chile large firms account for 80% of all nationwide sales, they only generate 53% of Chile's total e-commerce. SMEs contributed only 17% to "real world" sales, while they made up 46% of e-commerce revenues in 2001. SMEs in Chile are trading in cyberspace proportionally more than two-and-a-half times as much as they contribute to "brick-and-mortar" economic activities in the country (Hilbert, 2002).

SME PROPORTIONS IN CHILE



Source: Martin R.Hilbert, «Electronic Supply Chain Management for Manufacturing SMEs in the Mercosur», Vienna, United Nations Industrial Development Programme (UNIDO) in cooperation with the Economic Commission for Latin America and the Caribbean, UN (ECLAC), unpublished, 2002.

In the Chilean example, the great participation of SMEs in the country's e-commerce revenues, highlights the sector's potential and points to an area worthy of attention from governments and multi-lateral lending agencies. Given the predominance of SMEs and their structural importance for the Latin American and Caribbean economies (perhaps more in terms of the employment opportunities they provide rather than their actual contribution to GDP) this points to an opportunity worth exploring. One of the keys to building the Internet presence of micro-enterprises and SMEs is providing training and technical assistance that can help them connect to national and global supply chains (for procurement and selling/exportation purposes).

C2C auctions

At the end of 2001, the Boston Consulting Group (BCG) revealed that consumer-to-consumer (C2C) auctions were by far Latin America's leading retail e-commerce category in 2000. With US$ 203 in revenues (2.2% of total Latin American e-commerce), the following year auctions were second to direct automotive sales (US$ 504 in revenues and 5.2% of total e-commerce).[10] As in the United States, the majority of auction traffic in Latin America and the Caribbean is concentrated in very few sites. Although

[10] The strong participation of automotive sales (40%) of B2C and C2C sales in Latin America in 2000-2001, surged as a result of concerted efforts by Fiat, Ford and General Motors to market and sell low-priced cars online.

the sector has demonstrated its potential long-term viability, the network effect resulting from the concentration of traffic is likely to accelerate the process of consolidation among auction sites.

(c) B2B e-Commerce

Building the Platform

For most companies, business-to-business e-commerce represents the next generation of business automation following the enterprise-wide unification of business information systems through the implementation of inner-firm software (like Enterprise Resource Planning [ERP]). Essentially, e-commerce involves extending an internally-automated enterprise to its trading partners (such as through the interconnection of Customer Relationship Management [CRM] or Supply Chain Management [SCM] systems) (see Section "Generic Services"). This can happen through direct interconnection between companies —usually driven by the B2B portal of a large company— or through independent intermediaries who set up B2B e-marketplaces (portals). Much of the early focus of B2B e-commerce has been on the purchasing side, but an extended enterprise also connects to the sales-side channel partners, distributors and customers. Collectively, this extended enterprise system makes up the "value chain." Real-time business information, facilitated by the Internet, will eventually flow from the front line of customer service through an enterprise and up its supply chain. The entire set of related technologies, from private extra-and intra-nets and public exchanges to SCM and CRM systems, falls under the general umbrella of e-business. The emerging leadership in e-business from large brick-and-mortar and other traditional companies such as auto manufacturers and agribusiness concerns is spurring other companies to adopt e-business in Latin America and the Caribbean. In many cases, Internet-related initiatives have become part of core business strategies and are supervised by top-level executives. As companies like Volkswagen and the Brazilian supermarket chain Pão de Açúcar expand their enterprise-wide use of the Internet across their trading networks, they will drive the adoption of B2B e-commerce technology throughout the region.[11]

The size of the market for industrial products is difficult to estimate, given that many B2B firms are still privately-owned. However, according to the Brazilian consultancy Symnetics, industrial products sales accounted for 70% of the Brazilian B2B market in 2000, while services, including

[11] Some of the analysis of general trends in B2B e-commerce derives from eMarketer's *eCommerce: B2B Report* and from discussions with the report's author, Steve Butler.

maintenance, resources, operations and logistics accounted for approximately 30% of B2B transactions. Symnetics research maintains that 37% of B2B portals in Brazil serve the construction industry, 18% are dedicated to textiles and the remaining 45% are split evenly among the automotive, metals, mining, chemicals and consumer packaged-goods industries. In Chile, the Santiago Chamber of Commerce found the distribution of B2B sites to be biased toward the following sectors: manufacturing (26.6%), professional services (16.3%), retail (14%) and personal services (10%), with ICTs, transportation and telecommunications accounting for the remaining 15%. While not exact portraits, these breakdowns at least provide an outline of the overall B2B market in each country. Moreover, the concentration of sites represents opportunities for enterprise application vendors, outsourced Internet services and e-business consultancies.

Latin American businesses are moving more quickly to implement CRM solutions to sustain trade with business partners, particularly in Argentina, Brazil and Mexico, the region's three largest markets. According to IDC, 10% of large companies surveyed already have a CRM solution in place and an additional 10% are in the process of implementing such solutions. The emphasis on CRM over other e-business systems reflects an effort to derive increased revenue by deepening relationships with existing customers. By understanding customers better, businesses can provide them with more targeted value and hence, greater incentives to spend. The key, particularly for multi-channel retailers, is cross-channel integration of information systems. Customers should be able to get in-store service for or be able to return an item they purchased online. Likewise, they should be able to resort to the web for questions about or problems with a product obtained in a traditional retail outlet.

Approaching the B2B Learning Process

Familiarity with e-business applications and use of them remain unequally balanced, which is unsurprising given that e-commerce in Latin America is still at a relatively early stage. For example, IDC has found that 52% of Mexican companies of all sizes are still unfamiliar with enterprise resource planning (ERP) software applications, while almost two-thirds have little knowledge of SCM applications. An even greater percentage (70%) is not familiar with CRM. In Brazil, meanwhile, Symnetics found that 67.4% of companies were moving in the direction of implementing CRM, although only 10.9% had CRM applications already in operation. Following global trends, deployment is far more advanced in call centers, helpdesks and sales force automation than in e-commerce operations, although 75% of the companies surveyed expected to roll out CRM in their e-commerce operation by the end of 2002. As with any new technology, the implementation of e-commerce applications will entail a considerable learning process within each organization, and leaders must be prepared to close the gap as quickly as possible by making digital service tools an integral part of the company culture.

Among the wider business population, most companies still face a great deal of integration work to make their Internet-based operations flow smoothly with the slower legacy systems they continue to use internally. Integrating e-commerce systems with manufacturing operations and with other back-office systems is perhaps the leading challenge of e-business in Latin America as well as worldwide. For example, while according to IDC, 30% of large enterprises in Brazil and 24% in Mexico have WebSites that accept online orders, just 27% of large enterprise WebSites in Brazil and 13% in Mexico were integrated with order processing systems.

It is interesting to observe that the fact that companies are using the Internet to purchase indirect materials such as office supplies, software, electronic goods and peripherals, emphasizes the extent to which online procurement is still at an early stage. These four categories represented 90% of the goods purchased by companies included in a Prince & Cooke study of large enterprises in Argentina, with office supplies alone accounting for 70%. One significant reason behind large enterprises' prioritization of indirect procurement software implementations is that for many businesses, indirect procurement has historically been the least-automated segment of their purchasing operations.

Finally, the various survey results underscore the fact that in spite of the cost savings and efficiencies companies may derive from using the Internet in their internal and external operations, they cannot proceed to enterprise-wide e-commerce overnight due to the expenditures involved in and the complexity of system upgrades and integration. Additional complications are the security and trust issues related to sharing internal information with trading partners. Moreover, to truly profit from e-business service tools, not only an individual company but also its suppliers must invest in automation, which is a process likely to take longer among smaller enterprises with fewer resources and less access to capital. Consequently, a multi-channel environment will exist over the medium term as companies migrate to new, Internet-based systems.

A state of evolution and uncertainty also prevails where online exchanges are concerned. In very broad terms, exchanges can be divided into buy-side and sell-side systems, with both types in an expansionary phase across Latin America. On the buy side, most companies have the option of building their own private, Internet-enabled supply chain networks or participating in a consortia-led exchange, although the likelihood is that over time, hybrid approaches will emerge. As in other regions, market leaders have yet to materialize, with many exchanges still in the launch phase and lacking the capacity to enable true e-commerce.

For example, according to Symnetics, 38% of Brazil's B2B portals lack auction, request for proposal (RFP) and request for quote (RFQ) functionality, which are the three basic ways to initiate the negotiation and transaction process. Pyramid Research believes that eventually, private B2B networks, typically owned and operated by a single large firm (like Pão de Açúcar's proprietary exchange, Pd@Net), will account for the majority of transactions and revenues in the region.

It is notable that for many mid-sized and smaller businesses, fewer choices are available. By necessity, most will have to conform to the choices made by their largest trading partners, resulting in a need to connect their systems with multiple online trading platforms. Most smaller and mid-sized suppliers are unlikely to have either sufficient resources or influence in the marketplace to build their own sell-side networks and convince customers to purchase via or link their buy-side systems to these sell-side exchanges.

(d) B2C e-Commerce

Latin Americans shop online for convenience purposes and to find lower prices. Surveys indicate that they save time by buying online. The leading products in most countries are largely the same, and in fact, similar to the types of goods consumers around the world buy online. Given the long tradition of home grocery delivery in many Latin American countries, the food and beverage segment appears promising for online merchants. As noted above, auto manufacturers in Brazil have had considerable success (in limited trials) selling cars via the Internet to consumers, who benefit from lower vehicle prices resulting from more efficient product planning and reduced dealer inventory costs. Travel, which until recently has been the leading consumer e-commerce category in the United States, is another segment likely to see increased activity as leading online agencies establish high-profile partnerships with the major portal sites throughout Latin America. The same accounts for the traditional B2C segments, such as books, music, electronic goods and software.

Despite increases in the quantity and diversity of consumer WebSites, revenues from online retailing in Latin America's leading consumer e-commerce markets (Argentina, Brazil and Mexico) remain highly concentrated among a limited number of e-commerce sites. According to a study by the Boston Consulting Group and Visa International, Latin America's top 25 online retailers took 83% of the region's total B2C e-commerce revenues, while in all three countries, the three leading players in each retail category produced more than 70% of revenues (BCG, 2000). This uneven revenue distribution presents a clear challenge to smaller players with more limited funding and lesser-known brands.

Approaching the B2C Learning Process

A large percentage of Latin America's Internet users has little online experience and spend a moderate amount of time online, primarily due to the high cost of metered dial-up access. This partly explains why shopping online is a less popular activity than specific surfing and sending e-mails. Experienced Internet users, particularly those considered "heavy users," tend to be far more comfortable with the process of buying online than moderate-to-light users with little experience, who typically are more concerned about privacy and security. The need to click through a high number of pages to complete a purchase may also deter less experienced surfers. Overall, consumers remain more comfortable with using the Internet to facilitate offline transactions than actually completing transactions online. For example, going online to research product or service information and then completing the transaction offline.

In order to increase users' trust in the Internet and accelerate training of users in how to use it, large retail chains such as Brazil's Magazine Luiza have been experimenting with physical stores that contain no merchandise but rather, Internet-enabled terminals and a small staff to assist customers with the ordering and credit application process. This example is innovative for several reasons. The system not only saves the company the expense of stocking the store with merchandise (and in turn allows the chain to extend its reach without incurring much in the way of additional costs) but also gets customers comfortable with ordering goods online. Since the learning process is one of the largest obstacles for Latin American e-commerce, this model could serve as a solution to promote both, efficient retailing and customer training. In order to extend use of the Internet for shopping purposes to a broader spectrum of the population than the ABC_1 socioeconomic segments, typically targeted by online retailers, a degree of in-person training and guidance is necessary to build consumer understanding of and trust in the online buying process, particularly among those groups that are likely to have the least Internet experience.

In addition, many Latin American consumers still shop online at foreign WebSites, particularly those in the United States, which is home to the majority of the world's online retailers and where the product selection tends to be greater.[12] Brazilian consumers are the lone exception in Latin

[12] In an effort to serve Latin Americans who like to do their online shopping at United States WebSites, several companies have developed a service that provides consumers with a mailing address in Miami. Consumers can then purchase products from United States Internet retailers and catalog merchants and have them shipped to Latin America via their Miami address.

America in that they shop predominantly at domestic sites. Several factors explain this preference for national retailers. The majority of the region's consumer e-commerce sites are located in Brazil. Cumbersome formal and informal import barriers and customs fees make buying at home more effective. And Brazil has the largest consumer market in the region, and hence, a broader product selection.

SHARE OF CONSUMERS SHOPPING AT DOMESTIC AND FOREIGN WEBSITES IN LA, THE U.S., AND EUROPE, 2000
(*percentages*)

	Domestic	**Foreign**
Argentina	37	63
Brazil	61	39
Chile	25	75
Colombia	34	66
Mexico	40	60
Peru	20	80
Venezuela	23	77
Latin America (average)	41	59
U.S.	91	9
Europe (average)	41	59

Source: InfoAmericas, «Market intelligence and strategic consulting» (http://www.infoamericas.com/), 2000.

However, there is evidence that since InfoAmericas conducted its region-wide survey in mid-2000, a shift toward domestic online retailers has taken place in Chile, where 43% of consumer e-commerce spending went to national retailers in 2001. The rise in the number and variety of online retailers as well as an increase in the products accounted for this shift.

The Role of Banks

Latin American banks are well positioned to provide online payment services to their consumer and corporate clients. A total of 64% of the Chilean SMEs for example, maintain contact with their bank through the Internet, which makes up the lion's share of online transactions in Chile. In 2002 only 16% of Chilean enterprises considered online banking as "not necessary" or "prefered personal contact" with their bank (Subsecretaria de Economia, 2002). Brazil's Bradesco, a pioneer in offering free Internet access to its customers, was the first bank in the region to recognize that the members of the country's lower-income socioeconomic segments required incentives to get online. By establishing direct Internet links with telecommunications providers throughout Brazil (rather than purchasing subscriptions from ISPs, distributing them among the bank's customers and passing along the subscription charges in the form of increased fees), Bradesco was able to avoid dealing with intermediaries and hence build a nationwide access network at a relatively low cost. With its growing online user base, Bradesco extended its reach to e-commerce. Scorpus, the bank's technology arm, developed an electronic wallet for Bradesco customers, and the bank established a shopping portal (which evolved into ShopFácil) that allowed retailers to sell directly to the bank's customers. By simply providing the platform for the transaction, the bank was able to connect customers and retailers, but without violating its clients' privacy rights. On exiting the Bradesco Internet banking site, users are passed along to the ShopFácil e-commerce portal and consequently the bank's customer base remains the logical customer base for the shopping portal. However, because ShopFácil is part of a separate company, its services are also available to non-Bradesco customers.[13] This model has been widely emulated throughout the region, although some of the online malls remain "walled gardens" accessible only to bank customers.

ALTERNATIVE SOLUTIONS FOR MISSING CREDIT CARDS

The generally low level of credit card ownership and use in Latin America is a well-known impediment to the growth of consumer-based e-commerce (with the notable exceptions of Argentina and Brazil). Only the wealthy in Latin America hold credit cards to any significant degree and most consumers, particularly those from lower-income groups, are still far more likely to have credit extended by multiple retail outlets rather than an actual credit card. However, due to their general demographic profile, Latin American Internet users are more likely to have credit cards and checking accounts than members of the general population.

Given such obstacles, online merchants continue to offer consumers a variety of payment options. Among the most popular are deposits to a merchant's bank account, direct debit from a customer's account, banking tickets and payment in a brick-and-mortar retail outlet. Although these options add time, expense and friction to the online transaction process, they may offer a way of overcoming the barriers to more widespread e-commerce in Latin America until chip-based "smart cards" and digital cash systems reach a greater portion of the population. Such systems include electronic wallets that store and protect consumers' personal data with 256-bit encryption. According to research by e-bit and IBOPE eRatings, 18% of online retailers in Brazil now accept payment via electronic wallet, so the technology shows signs of spreading. Several digital cash systems are also available in Argentina, some of which specifically target Internet users who do not have bank accounts.

[13] ShopFácil and Scorpus were spun off as part of a separate company, Bradespar, which handles the operations that are not part of the bank's core business.

The lesson from the Bradesco case is simple. Banks have invested heavily in automated and secure transaction systems and many possess a growing online user base. This gives banks leverage to make e-commerce alliances with online retailers, which benefit not only from the traffic they can send to the retail sites but also because banks serve as a secure purchasing channel. In general, the most effective solutions will be those that adapt to the region's infrastructure and economic constraints and are consistent with the buying habits and patterns of consumers. Banks are trusted partners to retailers and consumers and are also leading technology innovators. As such, they stand to play a central role in fostering B2C e-commerce in Latin America. Although conceived as a means of reducing the costs of bank transactions and increasing customer loyalty, Bradesco's offer of free Internet access also spawned what is in essence a successful private-private partnership. This partnershiphas helped to stimulate Internet usage in Brazil without placing sole responsibility for technology development on the state.[14]

B. E-Government[15]

The relationship between the state and the Information Society is multifaceted and multidimensional. Thus, in the face of the tremendous technological changes that humanity is going through, the state is, or may be, both actor and spectator, potter and clay, promoter and critic, activist and custodian, and leader and led.

In the context of these multiple relationships, which are moreover indefinite and in constant flux, a discussion has arisen over the past few years concerning the virtual state (Fountain, 2001) or electronic government. This debate has covered both the operational and management dimensions that the mass use of information and communication technologies (ICT) is bringing to governments. The debate has also covered the role that the latter gives the government in promoting the Information Society, the risks of implementation, the role in the digital divide and its impact on the

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[14] Note that Bradesco's Internet banking solution developed out of the historical experience of Brazilian banks, which included decades of hyperinflation, the inability to gain access to international bank technology products (such as secure encryption software) and the unsuitability of existing solutions to Brazil's particular situation. As a result, Bradesco, through its acquisition of Scorpus, developed proprietary technology in-house.

[15] This Section is a contribution from Claudio Orrego, Vice-President of Business Development of SONDA, and a former Minister of State and former Executive Secretary for State Modernization in Chile.

democratic system, etc. Perhaps the only weakness in this rich and interesting debate has been the systematic omission of the context in which this phenomenon is taking place, as these changes do not occur in a vacuum. There are other phenomena that condition and affect them, and below we shall consider some of those factors.

The first and most important is the modernization of the state. This agenda is broad, difficult (technically and politically) and long-term. It includes topics such as regulatory frameworks, justice reform, the new forms of participation of private individuals in the provision of public services, the reform of the civil service, improvement of management, etc. As can be seen, it is a broad and rich agenda. It is in the framework of these reforms that the technological issues and in particular e-government, have strongly emerged. The question then, is how to use the Internet and ICT to foster modernization of the state?

In addition to the movement towards state modernization, which is already being consolidated and has reached a global scale, there is another phenomenon that impacts electronic government; economic globalization and the pressure of competition. In this context, state reform ideas or programs are very often not only promoted by visionary politicians who want to improve the quality of life of the population, but also by a private sector that is eager for and in need of profitability as any gains in efficiency could spell the difference between success or failure.

Another universal factor is international and domestic pressure for greater transparency at government level. The only too frequent corruption scandals that shake the still fragile Latin American democracies have dramatically worn away citizens' confidence in political institutions and the state, and led to the flight of foreign investment. In this global campaign for greater honesty, in which institutions like International Transparency have played a fundamental role, the importance of using new ICTs to achieve these aims has become greater than ever.

1. What for?

One of the main risks of any large or small electronic government project is a lack of clarity of the objectives it wishes to achieve. The recipe for failure of information initiatives usually comes from optimists who, blinded by technological marvels, overestimate their potential and underestimate their limitations and obstacles.

The first thing, then, that a public organization should do before rushing to approve generous budgets for this type of initiative, is to answer the important question of what it needs e-government for. Or in other words, what public policy objectives should it seek through e-government? This question is vital for any public policy, and even more so in technologically related projects. The latter, as well as being expensive, are generally very difficult to introduce. Some of the more commonly discussed objectives are referred to below.

As in the case of e-business, e-government also promises to improve the speed and quality of services, which in this context are public administrative services, which are often renowned for their “slowness”. Although the reasons for this slowness are varied, one of the most common is the excess of paperwork involved (and resulting procedures) in the administration process between the state body and the citizens. Although the mere incorporation of technologies into the administration process is not sufficient to change this situation, because they might also make unnecessary procedures more efficient, in general it has proved a necessary element.[16] The incipient integration of the digital signature in public administration will further assist in reaching this objective.

Also, just like in the business world, transactions through digital networks should generate savings and greater efficiency. However even if these benefits are the most sought-after objectives, partly because they form a good and easy argument for convincing authorities and public opinion, e-government should not be presented merely as a cost-reducing strategy. This is because, though e-government solutions can bring substantial savings over time, these savings are often, and with few exceptions, not immediate. Apart from the savings for the general public and the private sector, a recent study in the United States estimated organizational savings of close to 15% generated by the use of electronic mail (Fountain and Osorio, 2001). At the efficiency level —when efficiency is understood to mean better and more timely communication, coordination and collective work between state institutions— e-government generates previously unknown capabilities. One of the most obvious is it eliminates duplication in collecting, updating and storing information, distributing mail and saves paper and time.

The mass scale of the Internet and the potential to bridge the digital divide are also possible objectives of e-government solutions. In general, one of the objectives of e-government is to help accelerate countries’ access to the heart of the Information Society. This is not only because digitization of the state is very important in society, but also because the government’s actions in this field have a multiplying effect that is unequalled by any other

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[16] In Chile’s case, all public services that have received awards for management quality or innovation have had a significant technological development plan.

institution or actor. In countries where the Internet penetration rate is low, as is the case in all of Latin America, it is not the demand for on-line services that generates a high level of supply, but exactly the opposite. In other words, only a strong supply of good and necessary Internet services and content is capable of substantially accelerating the currently vegetative growth rates in Internet use.[19] This is assuming that the state itself is a leader in the field, and that one of the goals of implementing e-government is to benefit the community.

Digitalization of the state also contributes to narrowing the digital divide. As noted by the UNDP in its 2001 human development report, the digital divide has become an important topic on the development agenda at the beginning of this century. This divide, which is caused by the unequal opportunities to access and use ICTs within and between countries, can and should be overcome by decisive state action in creating network content and services, community Internet access centers and Internet training schemes for citizens.

Governments that adapt new technology can also benefit from greater public transparency and more efficient mechanisms to fight corruption. Although it may not always be desirable or appropriate to publicize this objective (in order to avoid provoking more resistance), it is certainly one of the areas where e-government could bring greatest benefits. E-government solutions permit intelligent use of disaggregated information of hundreds of databases (thus detecting fraud, inefficiency and irregularities) and the possibility of shedding the light of public scrutiny on shady and dubious areas full of irregularities, such as public purchases. The two most significant e-government experiences in this area in Latin America to date are Mexico's compranet.gob.mx and Chile's chilecompra.cl. Both examples have brought greater transparency to the whole process of public purchases and tenders, by creating Internet portals where any person or provider can obtain information and follow up on any public purchase.

One of the possibilities that governments have not yet fully exploited is the enormous and new potential for greater civic participation in society that the Internet and e-government offer the average citizen.[18] From the

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17 After four years in operation, the system of on-line tax returns in Chile has become one of the world's best practices in this area. In 2001, 790,000 tax returns were filed over the Internet, which represents 95% of all tax information, and 67% of all returns. However, less obvious is the fact that a high percentage of Chilean executives recognize that the decision to connect their company to the Internet was influenced to a significant degree by the possibility of declaring taxes on line.

18 For more information see Orrego and Araya (2002): "Internet en Chile: *Oportunidad para la participación Ciudadana*".

capacity to provide access to all public information, to the possibility of participating in discussions of new public policies, the Internet provides the average citizen unsuspected ways to break the mould of isolation from policy and the state. The Internet offers citizens alike the opportunity to participate once again in public issues that interest them. The many benefits of citizen e-participation include renewing the spirit of accountability that should be a key tenet held by political representatives of any solid modern democracy.

2. Conditions for success

The mere fact that a government has clear and realistic objectives is still not a guarantee that the e-government program or programs will be a success. In order to guarantee the success of a government information project, it must comply with a series of conditions that have proved to be fundamental. The influential report of IBM world head of government services (Ramsey, 2000) demonstrated how 85% of government information projects show some degree of failure, measured in terms of not meeting implementation deadlines, higher costs than those budgeted for and providing less value than expected. For that reason it is important to identify the key conditions for success.

A minimal level of infrastructure:

This condition is fundamental (see also the Section on infrastructure), as having a virtual state which no one can connect to is not only wasteful, but slows down the country's development. Although a computer network alone does not constitute an electronic government, it is necessary to have a minimum of the latter to even begin to think of what it is possible to achieve. In fact, one of the vital factors for success is having a critical mass of software, hardware and connectivity.[19]

Technological capacity:

Machines are merely tools in the hands of individuals who may or may not be able to use them in such a way as to maximize their potential (see also the Section on human capital). If the people controlling those tools feel intimidated by the systems, do not have a vision of what they are

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[19] It is not surprising that countries that have generated modern telecommunications markets and high Internet penetration levels (such as Singapore, Finland, Sweden, etc.) have not only increased their country's competitiveness and shown good economic performance, but are also leaders in electronic government.

supposed to be used for and why, do not have the minimum competency in using them, or do not see the benefit that that technology could bring to the everyday lives of themselves and other users, then there will be no e-government. This will be the case no matter how many technological tools they are surrounded by.

Leadership:

The most critical factor required for the success of any process of organizational modernization and change that involves technology, is clear and strong leadership. In the case of the public sector, this leadership cannot be only technical or at an intermediate level; political leadership and maximum authority is also needed. Without the latter, the transformation to e-government may be possible, but is difficult (see also the Section on strategies).

Alliances with industry:

All governments that have tried to re-invent the wheel, be self-sufficient or create their own technology, have ended up both spending huge amounts of money without achieving the desired results and frustrated because of time wasted. Strategic alliances with technology companies for systems development, and the implementation and operation of technology are essential. This does not mean that the relationship will be easy. It is often difficult for the state to have alliances with the private sector. Sometimes there is a barrier because of the enormous differences in legislation and culture, or because of information asymmetries, etc. On the whole, in order to have a successful electronic government it is necessary to develop the capability to have an advantageous, productive and transparent relationship with various allies in the private sector (see also the Section on strategies and financing for a universal Information Society).

Public policies:

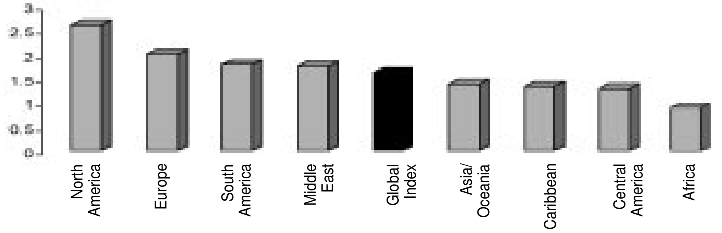
The creation of an e-government cannot come about in isolation or in a vacuum. It must be part of a greater modernization and technological change policy. Yet even that is insufficient. For a national e-government program to be successful, this calls for an authority with the capacity for inter-ministerial coordination and political sanctioning, which in turn has technical support teams that continue to generate public policies. For example, from the moment the state takes its leap into the Internet era, it needs to have policies on inviolability of communication, information security, privacy of information (see also the Section on a legal framework), outsourcing and bidding, and financing, etc. Without these policies, any initial progress may be lost and the credibility of the e-government will be weakened.

Emblematic high-impact and short-term projects:

As an e-government cannot achieve everything at once, it is important it gives adequate priority to the most emblematic projects or those considered to be the most ground-breaking. The latter are those that, once installed within the state, form the base that legitimizes and positions the electronic government and ensures its mass growth. Such projects will show visible results to the public and the main stakeholders within a relatively short time. In order to fight against the prevailing skepticism in this area, it is important to make rapid gains that encourage and strengthen confidence in managers and leaders.

BENCHMARKING E-GOVERNMENT IN LATIN AMERICA

In a recent e-government study among the 190 United Nations member States, South America and Mexico were ranked with between medium and high e-government capacity. Brazil was ranked number 18 worldwide, Mexico 22, Argentina 31, Uruguay 34 and Chile 35. Central America and the Caribbean's current capacity for setting up e-government was the "minimal" (ranked between 47-112).



Some of the countries in the region are making steady progress. However, several governments are still lacking strategic vision, program coordination and a balance between real citizen-centric concerns and constituent needs. There was very little evidence of coordination among ministries and agencies in Latin American e-government initiatives. Online services are not organized around the needs of the citizens but rather the objectives of the service provider. Throughout Latin America in general, but particularly in South America, there are three issues that impact on the enabling environment: diffident political leadership; inadequate commitment to a citizen-centric approach, and the digital divide. The research suggests that most of South America is moving toward an approach that prioritizes service delivery to businesses at the potential expense of individual public services to citizens.

(continued)

Benchmarking e-government in Latin America (concluded)

Nearly all 12 of the South American nations have an extensive e-government web-presence. In each country, the majority of online services are information-orientated. The supply of interactive and transactional services is still inconsistent and primarily addresses the needs of the business community. This may be due to a combination of several factors. These include the strategic importance of the business sector as a source of government revenue and the likelihood that businesses will more regularly use e-government services than individual citizens will since they are more likely to have regular access to the technology. Other factors include a cultural hierarchy that historically favors the affluent class and the fact that governments can publicly demonstrate a greater degree of success with the business community than with the delivery of individual citizen-centric social services. Online service delivery to the business sector is a strategic planning priority that can be seen as a tool to facilitate economic development. This is particularly true in Chile, and to a lesser degree in Paraguay, Argentina and Uruguay. It is commonly promoted that if a country can demonstrate a strong enabling environment; increased foreign investment will follow. Prioritizing service delivery to the business community could also potentially generate an accelerated revenue stream for the government. Administratively, Brazil is in the process of upgrading back office capacity by a new administrative model. There are also plans for the creation of an infrastructure linking Internet services of the Federal, State and Municipal governments. Throughout South America, e-government is a high priority.

In Central America each country did demonstrate an average e-government web presence measure, confirming that e-government has secured a place on the national policy agendas of each country. Yet e-government development for six of the seven countries lacks consistent coordination and a clear vision. Throughout Central America, online services are restricted to information provision. The content does, for the most part, address the needs of the constituents and is regularly updated. Costa Rica is an excellent example that shows promise. The national e-government program is consistently making progress. Costa Rica is also succeeding in carefully balancing the needs of citizens with those of the business community, although there were no transactional and very few interactive services available to both citizens and businesses in 2001. E-government access measures are less than adequate throughout Central America due primarily to a weakness in several of the infrastructure areas and a reluctance of most governments to fully commit to a citizen-centric approach.

With regard to the Caribbean, it was stated that only Jamaica demonstrated a steadfast commitment to e-government. Even though human capital indicators are over average in the Caribbean, Web presence is very low, suggesting that each country is still determining their best approach to providing e-government online services.

Source: UNDP/ASPA (United Nations Development Programme/American Society for Public Administration), *Benchmarking e-government: a global perspective, Assessing the Progress of the UN Member States,* May 2002.

3. Stages of electronic government

Although there are no universal recipes, an analysis of the experiences of various countries offers at least five stages in the development of electronic government. The latter do not necessarily have to occur in the same order, but they certainly range from a lesser to a greater degree of complexity.

(1) Digitization:

The first stage of electronic government, even prior to Internet connection, is the establishment of a broad computer base in public institutions. This assumes not only the existence of computers for secretarial or even professional tasks, but also the digitalization of the tasks of calculation, finances, accounting, human resources information and/or beneficiaries of policies, generation of databases, correspondence office, etc. As this is the easiest stage to implement, it is far from exhausting the full potential of e-government.

(2) Presence:

Given that the basic task of a government is in collecting, processing and providing information, a larger state presence on the Internet will allow better and more frequent citizen access to that information and to the services deriving from it. In fact, through the establishment of a web page or portal, public services can provide an enormous amount of useful information to citizens, community groups or businesses. In this way, without incurring higher costs (and even reducing them) the state administration can extend its hours of service (24x7), increase the number of places of access (any on-line computer) and the number of persons that can be dealt with without increasing the number of staff members.

(3) Interaction:

The third level of electronic government seeks to take advantage of the two-way communication between the citizen or company and the government, and between the latter and the citizen, and make it into a true virtual dialogue. It is a matter of overcoming the idea that the Internet is a large window through which the citizen can only seek static information, in order to create the idea of a space of true interactive communication. This translates into the possibility of communicating by electronic mail, in the search of information, which may exist in remote databases, to making complaints and/or sending suggestions. Perhaps the most challenging possibility from the democratic point of view, is that of participating in discussions to define public policy whether that is at an administrative, municipal or central government level.

(4) Transaction:

A fourth level of e-government consists of moving from communication (whether participatory or not) and from mere access to information, to a situation in which the citizen can carry out his transactions on-line. This means that many of the operations that the citizen previously had to carry out in person and on paper in public offices can be carried out today entirely by Internet, without having to move from one place to another. These operations may range from sending explanatory messages to requesting a certificate, paying a fine, declaring taxes or applying for a subsidy. It is precisely at this level of e-government that the main savings begin to be seen, both directly for the government and indirectly for those interacting with it.

(5) Integration and transformation:

It is not enough to have only computerized and connected management on the Internet, with two-way communication between the government and the public and with on-line transactions. This is not sufficient to break down the various self-sufficient and closed bunkers that exist in every government. In fact, one of the worst nightmares of state bureaucracy is when citizens need to apply to various public institutions in order to receive a response or authorization, and the response they get from one institution may not always be the same as the one they get from another. For this reason, one of the greatest contributions that e-government can make is the interconnection of public agencies. This, however, is not easy. It involves redesigning processes, changing standards and modifying behavior, in such a way as to allow the existence of true "one-stop shops" in the state. This level of efficiency, which involves a delicate integration of bureaucracy and information science, is not only possible but is the level that generates the greatest benefits of e-government.

On the whole, the degree of internal resistance that this type of project may encounter should not be underestimated, nor should the leadership capacity of the technical teams within the governments be overestimated. In view of the above, it is difficult to exaggerate the importance of political leadership in this type of initiative. Electronic government requires a person who is capable of translating the importance of electronic government and the direction to be taken with it into the language of the citizen. It requires someone capable of persuading the administration and the citizens as to the benefits of this new mechanism, and of breaking away from petty interests and acquiescence to inertia. Without such clear and permanent leadership, electronic government may be reduced to only a small set of modernization projects.

C. E-Health[20]

Over the past few years, telecommunications-mediated health interventions have made headlines around the world with such dazzling applications as surgical procedures performed by remote-controlled robotic devices, the transmission of digitized medical images and biological signals, and the use of real-time teleconsultation. However, those "B2C-model" types of service represent only a small fraction of the large number of possibilities offered by Information and Communication Technologies (ICTs). Although not as eye-catching, a multitude of clinical and administrative ICT applications have been developed and progressively are finding their way into health organizations designed to automate intra - and interorganizational health structures and healthcare processes, logistics, and decision making. In the long run, a fully integrated ICT-supported practice presents the greatest potential benefits to individual and collective health as well as the most important deployment challenges to systems professionals and decision makers. This trend is exemplified by the growing development of "e-health", an area which, goes far beyond tele-medicine. Most e-health solutions build on e-commerce and e-government strategies and experiences in using Internet-based networked technologies to reorganize how businesses and public services operate. It includes patient care (B2C and G2C) and interprofessional and interorganizational exchanges (B2B and B2G).

1. Trends and Issues

Among the problems facing health and healthcare in Latin America and the Caribbean, the following are the most critical:

- The health sector faces two demands that appear, on first examination, to be conflicting demands: firstly, to provide expanded and equal access to quality healthcare services and, secondly to reduce or at least control the rising costs of healthcare services.

- Health sector expenditures comprise 6.0% to 17% of the service sector that, in turn accounts for 50% to 65% of the GDP in almost all countries. The market for health goods and services in the countries of the region represent 9.0% of the global health

[20] This Section is a contribution of Roberto J. Rodrigues; Regional Advisor in Health Services Information Technology Essential Drugs and Technology Program, Pan American Health Organization / Pan American Sanitary Bureau, Regional Office of the World Health Organization

market, more than Eastern Europe and Central Asia combined and just below that of East Asia and the Pacific. The 1999 average per capita expenditure in health in Latin America and the Caribbean in PPP dollars was US$ 452. Compare this value with US$ 1,868 for the European Union, US$ 2,206 for Canada and US$ 3,978 for the United States. There is a marked variation on the national expenditures among countries, even for countries of comparable income level (Casas, 2001).

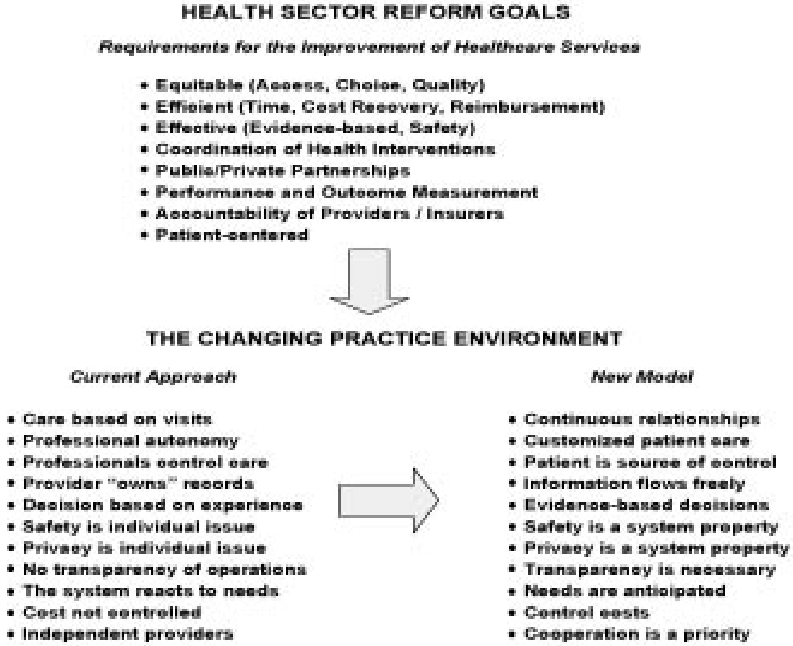
- Despite the fact that the health sector is key to the welfare of the population and to the formation of human capital, it has not kept up the pace with the momentum of change experienced in recent years by the region in other areas of economic, political, and social life.
- In high —and middle— income countries about 40% of the population has one or more chronic conditions and in many societies, chronic conditions account for up to two-thirds of healthcare expenditures. However, in each society, most expenditure goes on a limited set of health conditions— the "80/20 Rule".
- Changing demographics (particularly age structures) and lifestyles (mainly due to epidemiological profiles, urbanization, and growing industrialization) highlight the need to reorient healthcare models. An aging population requires greater subsidized medical care and puts a growing demand on the healthcare system for additional and high-cost diagnostic and therapeutic resources.
- Significant opportunities do exist to improve health status but there are a considerable number of preventable diseases and premature deaths, both in absolute and relative terms.
- Uneven access to basic health services results in many regions, communities, and social groups being left without access to even the most basic healthcare.
- In most countries the health sector is underfinanced with inefficient allocation of scarce resources and lack of coordination between health subsectors, institutions, and other social agents and those with vested interests. This results in having to double the efforts to provide basic care, overlapping of responsibilities, and waste of resources thus leading to quantitative and qualitative deficiencies in the delivery of health services and growing gaps in basic care provision.

(a) Health Sector Reform

Health sector reform is a process aimed at introducing substantive changes into the health sector and in the relationships among the main stakeholders and the roles they perform with a view to increasing equity in benefits, efficiency in management, and effectiveness in satisfying the health needs and expectations of the population (PAHO, 1996). Health reform processes in Latin America and the Caribbean have many facets and there is no single model being adopted by all. Each country is moving at a different pace in the implementation of its own particular health system model but the economic and globalization changes of the last years have brought a new urgency to the reform processes. There are, however, common trend-setters and responses that characterize most health sector reform processes occurring in the region: (a) the universalization of a high cost-benefit basic package of health services; (b) standardized public health interventions; (c) cost containment and recovery; (d) administrative decentralization and operation of healthcare services; (e) recognition of the role of the private subsector and the intersectorality of health interventions; (f) health models oriented toward primary care and centered on people; (g) focus on quality and accountability; and (h) moving away from the reactive delivery of care to a more proactive management approach of the health status of individuals and population groups (PAHO, 1996; 1998).

ICTs are an essential requirement of health sector reform. Information systems are crucial for the operational support and management of the new health and healthcare models. Information systems solutions and implementation strategies must address the needs of the new trends in healthcare. They need to emphasize a continuous relationship between providers and clients, customization of care, greater partnerships between providers, insurers, and clients and increasing client control of evidence-based health decisions. They need to ensure that information is not locked away in records and kept in separate sites with access limited to their authors but rather available to all the vested interests and finally greater transparency and cooperation instead of independent professional roles (see Figure).

THE CHANGING PARADIGM IN THE ORGANIZATION AND DELIVERY OF HEALTHCARE



Source: Roberto Rodrigues

Furthermore, information systems must support the prime feature of most new health models, i.e., emphasizing the continuity of clinical care sustained by health promotion and maintenance actions. The concept encompasses informed citizens who take care of their health and an assortment of public and private interests who are collectively responsible for delivering a continuum of evidence-based health services to individuals and the environment in the region. The variety of conditions and operational demands on the health sector require a great diversity of information resources and solutions. Such solutions must provide services to the challenging and interdependent array of clinical, public health, and managerial decisions and interventions that characterize health practice (PAHO, 1998; 1999; 2001; Rodrigues, 2000a; 2000b).

2. The Foundation and Practice of e-health

Although vaguely defined, the term e-health usually means electronically-facilitated clinical and service functions that go beyond purely business and financial transactions (Hagland, 2001). Among leading digital technologies, Internet-based ICT solutions are rapidly changing the way health providers, health plans, organizations, payers, regulators, and consumers access information, acquire health products and services, deliver care, and communicate with each other (Eysenbach, 2001; Della Mea, 2001).

The business imperative or e-health is concrete. Health is one of the largest sectors of the economy. In the United States alone, it accounts for US$ 12 to US$ 15 out of every U$ 100 spent each year, representing a market of one trillion dollars. Health services represent a US$ 3 trillion market in OECD countries (90% of the world total) and that figure is expected to increase to US$ 4 trillion by 2005 (Casas, 2001). Global demand for telehealth services is estimated to be worth US$ 1.25 trillion, about two-thirds of which is for direct services and the rest for second opinion, consumer information, continuing education, management and other services.

Solutions are driven by the operational requirements of health reforms, and are aligned to the same set of determinants found to be valid for e-business. These include the growth of a global marketplace, the importance of network externalities, the need for interorganizational coordination in networks, intraorganizational coordination in modules, relationship management and service customization, which all lead to the integration of information of increasing data granularity, better and faster services, and performance enhancement. The focus of e-health is the customer/client/citizen. Technologies, particularly the Internet, are the tools for information acquisition, processing, analysis, and communication but it is the individual and aggregated data about customers/client/citizens and about markets, products, processes, and finances that represent the underlying resource of value for e-health.

Particularly pertinent to e-health is the observation that success has been demonstrated in niche markets where customization is important. Relevance of information is related to data content about individuals and person-identifiable detailed data is critical to the successful operation of a variety of applications. Most of the ICT solutions applicable to the health sector are common across sectors or shared common elements. Especially in service industries where the "one-of-a-kind" product is the core of the business model (such as in investment, tourism, and travel industries) healthcare can directly benefit from the experience of the more advanced e-Sectors. Existing concepts such as the model SCM-ERP-CRM from the e-business sector (see section about "Generic Services") can increase collaboration in the health sector and thus facilitate the sharing of patient information, improving data accuracy and timeliness and create incentives for systematic patient participation in self-care. Especially Customer Relationship Management (CRM), which builds on the integrative collection, processing and evaluation of customer relevant information, interactive communication with the customer, as well as individualized performance have vast potential.

In developed countries, e-health has rapidly evolved from the delivery of online medical content toward the adaptation of generic e-commerce solutions to the processing of health-related administrative transactions and logistical support of clinical tasks. E-health is touching every stakeholder and a variety of systems have been deployed in the following areas:

- Professional Communication among Providers
- Logistics of Patient Management and Distributed Care Provision
- Health System Administrative Transactions
- Business to Business and Business to Consumer Transactions
- Biomedical Knowledge Management
- Electronic Health Record (Computerized Patient Record)
- Clinical Care (Telemedicine)
- Health Information Delivery to the Public
- Distant Education of Health Professionals
- Consumer to Consumer Exchanges (Chat and Special-Interest Groups)

Emerging e-health applications are oriented to professional networking, integration of the clinical care process management, and the provision of Web-based health information and patient care, including remote monitoring and healthcare. This expanded view of e-health has been promoted as the final stage in bringing the entire healthcare industry online.

3. Challenges to the Deployment of e-health in Latin America and the Caribbean

As in all the other Vertical Sectors of ICT deployment, technology distribution and access problems also represent a central obstacle in the dissemination of e-health (Rodrigues, 2000c). Dependable connectivity is needed for reliable transactions. However, the digital divide in the health sector is more than mere access to technology, as it also represents primarily the lack of human capacities, as well as the awareness and understanding of scientific and technological concepts and often even behavioral aspects and cultural rejection. The problem can be illustrated by the result of a 1999 survey of 42,744 physicians in Brazil. The study revealed that 52% used the Internet —a level of diffusion equivalent to the general population of the United States— however, when 23,603 physicians users were asked from where they predominantly accessed the Internet, 85% indicated their home, 10% the office, and only 2.0% accessed the net from their university and 3.0% from the hospital.

Employees' skills are the most expensive and least elastic resource and an obstacle to successful e-health implementation. People are central in the value-added creation of e-health products and services and an organization's human resource is the key to success (see also Section "Human Capital"). Systems professionals and technology products and services providers and project teams must also have superior skill levels and experience in the particularities of the area being automated. People-based change is the first factor of a successful deployment of e-health (Hagland, 2001). Successful organizations have demonstrated the capacity to maximize employee retraining, minimize investment in rare or transient skills that would do better being outsourced, and promote specialization and focused training, instead of training few individuals in many subject areas. These concentrated skills can then be shared, often independently from the geographic position, through the use of digital communication systems themselves.

As is usually the case with innovation, the agents that first move into the market quickly attain a dominant position, block the entry of new competitors, and capture a large part of potential proceeds. Market capture by strong, organized, and well-funded health provider organizations, some of international nature, is happening at a fast pace in Latin America and regulatory methods have been advocated to safeguard local competition. Indeed, electronic markets are a two-way street. While the increasing penetration of e-services in developing countries may result in the opportunity for local businesses to compete globally, those effects also carry great risks from the perspective of developing societies, as most enterprises in developing countries do not operate at efficiency levels and technical capacity that allow them to compete on an equal level with developed world enterprises. The fact is that the often praised "death of distance" is breaking down every form of informal industrial protection, which until now sheltered local health providers, introducing direct competition in previously inaccessible markets. This could in the short-term have positive effects on service quality, but could in the long run have negative effects on the development of adequate domestic capacity in order to be able to face local health problems.

Intangible health "e-Solutions" products and services offered by foreign providers, as is the case of investment, insurance, knowledge dissemination, healthcare applications, and telehealth present great challenges to developing and poorly developed countries and may result in a flight of capital, tax evasion, unemployment, capture of the health market, and "cultural colonization". The resulting scenario from such a process would be the creation of a "new global division of labor" centered on the more sophisticated health industry exclusively in the developed world.

(a) Lagging Involvement of Public Health Authorities

Many public health organizations in Latin America and the Caribbean are not taking advantage of existing ICT opportunities and most information systems presently deployed are inadequate to fulfil the requirements of the new models of healthcare being implemented in the context of health reform initiatives. Besides the common perception among physicians that health information systems are mostly a source of scientific and technical information, public health authorities often view clinical-administrative information systems as an obsolete and static "statistical-epidemiological" archetype. Such as archetype is seen as designed for collecting numerical data that only represents the number of events and which mostly generates only highly aggregated statistical data and time series' related to mortality, morbidity, and to service utilization and coverage. Those information systems carry very little practical interest for direct care professionals and for health program and unit managers and are severely lacking in providing the logistical and longitudinal individual client-based data required to operate and manage the sort of healthcare models being deployed in many countries.

As a counterpoint to the passiveness of the public sector, the private health sub-sector has already seen the writing on the wall. Private providers and health groups recognized that a "different" type of information system and data elements was required to run their organizations and survive in a competitive environment driven by increasing consumer demands and expectations and for the delivery of evidence-based quality and personalized services (Rodrigues, 2000c). ICT resources can boost productive specialization, such as allowing the efficient use of diagnostic services and consultations, the maintenance of integrated records, reduction in the number of specialists, and attaining economies of scale by linkages to national and international markets. However besides these uses of ICT resources there are many new areas of application that are rapidly gaining ground and reducing care costs while improving the continuity and quality of care (Institute of Medicine, 2001; Fortune, 2001; Eng TR, 1999). Those include non-tradable products or products with low-levels of tradability such as personal services, e.g., home care.

The lack of involvement of Latin American and Caribbean public sector interests in the ICT use is risky and worrisome. At a time when, in many countries, the ailing, bureaucratic, and inefficient public sector is struggling against poorly regulated privatization of social services, there is a clear danger that their inaction in adopting ICT solutions may indeed hasten the further reduction and even the demise of public health services already incapable of competing with an ICT-enabled private sector.

(b) Fast Changing Environments and Complexity of Health Organizations

Unfounded vendor-driven expectations of how the Internet will revolutionize healthcare, have also often overshot their targets (PWC, 2000). The lesson to be learned from the failures of many "new economy" business models for e-health, is that technology is a tool, which can only be justified economically if organizations deploy it in a real practice environment and closely track how managers and direct care professionals are using it. Similar to e-commerce, the vast majority of pure Internet e-health players have had very little impact. In a trust-based area like health, the development path of "clicks-and-mortar" appears to be the safest model. Broad objectives are difficult to achieve and measure meaning the best strategy is to identify the most repetitive costly tasks first —e.g., the automation of claims and reimbursement procedures— and then proceed area by area. This requires a well-planned and stepwise automation of intra- and inter-organizational processes with concomitant development and implementation of metrics to monitor productivity and impact (Hagland, 2001; PWC, 2000; Martínez et al, 2001).

Although private and public health care organizations are adapting at varying speed to new e-health processes and models, the organizational "culture", and the nature, and frequency of those environmental changes may create friction, desirable and some not so desirable effects, and personal behavior that may impede the attainment of the expected e-health project results. The complexity of health organizations and processes needs to be considered. Organizations and providers that already have computerized information systems in place must figure out how to link with the new applications and whether to incorporate their legacy systems or start anew. Regardless of the technology, while business rationale and processes can be split across many applications, shared data must remain physically or logically centralized. The tremendous expense and difficulty required to integrate the complex healthcare processes have opened the door to scores of companies offering outsourced services and products, such as application hosting and even entire IT departments for rent. Other firms specialize in data collection, systems and security management, practice management, medication management, claims payments, or desktop infrastructure (Hagland, 2001; Fortune, 2001).

Turning all or part of the business processes and management handling to external third parties (outsourcing) has been advocated as a more efficient form of operation and cost containment. Unfortunately there are no easy answers as to when, where, and what processes should be outsourced. It all depends on the organization's business processes and a number of environmental and market factors that are, sometimes, difficult to individualize (Meta Group, 2000). Outsourcing can involve other organizations or just the operations related to the computerized applications. Application Service Providers (ASPs) solutions have been promoted as a solution for the externalization of computerized business processes (see section "ASP" in the Generic Service chapter) but the results so far have fallen short of the expectations, mostly due to technological constraints and underestimation of the costs and labor required to deploy and maintain such systems.

(c) Regulatory Framework

Process and data standards for the managed care industry involving all constituents including employers, consumers, providers, payers, and regulators, which are promoted by accrediting organizations and particularly by the American Accreditation Health Care Commission (URAC), have facilitated the adoption of common procedures and routines. A certain amount of standardization also has been driven by regulatory action. In the United States the introduction of the Health Insurance Portability and Accountability Act (HIPAA) regulations forced a reluctant health industry to adopt uniform formats for health data exchanges and uniform code sets to identify internal and external health services activities and to be HIPAA-compliant became a requirement of all applications. However, even in developed countries the lack of national standards for unique person identification has slowed implementation of patient-based information systems. An extensive review and reference source on healthcare data standards was published by the Pan American Health Organization (PAHO, 1999).

Data security and privacy of personal health data are universal concerns and a high-priority issue in many countries. There is a growing concern about protecting health records against intrusion, unauthorized use, data corruption, intentional or unintentional damage, theft, and fraud. Given the sensitive nature of healthcare information, and the high degree of dependence of health professionals on trustworthy records, the issues of reliability (data residing in the electronic health record is accurate and remains accurate), security (owner and users of the electronic health record can control data transmission and storage), and privacy (subject of data can control its use and dissemination) are of particular significance and must be clearly and effectively addressed by health and health-related organizations and professionals. Reliability, security, and privacy are accomplished by implementing a number of preventive and protective policies that address the areas of physical protection, data integrity, access to information resources, and protection against unauthorized disclosure of information. Security and privacy issues can be a determining factor in the success or failure of a particular Web portal or ICT application. Legality and regulation of Internet-mediated transactions are still inadequate in many countries. Other areas are only at the incipient stage of implementation, even in developed countries. These include contract enforcement, ethical advertising, consumer protection regarding accuracy of products and services and use of sensitive and personal information by third parties and claims and liability assignment (Rodrigues et al, 2001).

However, most security violations are unintentional and the most damaging violations often occur within the organization. Operator's error is the most frequent reason. Health professionals, healthcare organizations, and society in general must address the issue of how to balance the need for access, integrity, and privacy issues of individual rights versus the collective needs of public and community health. A comprehensive review and reference source on personal data protection regulation was published by the Pan American Health Organization (Rodrigues et al, 2001).

Another challenge for the regulatory framework is the quality of publicly available information. This is probably one of the most serious issues in the area of Internet-based interactive health communications. The Internet offers unheard of power to provide all users of healthcare information, namely patients, professionals, families, caregivers, educators, researchers, insurers, regulators, and policymakers, with data of unprecedented timeliness, accuracy, depth, and diversity. Yet it is equally clear that the very qualities that make the Internet such a rich marketplace of ideas with its decentralized structure, its global reach, its leveling of access to publication tools , its immediacy of response, and its ability to facilitate free-ranging interchange, also make the Web a channel for potential misinformation, concealed bias, covert self-dealing, and evasion of legitimate regulation. It is very difficult to ascertain and recommend the credibility, motives, sponsorship, and eventual conflicts of interest of the more than 50,000 health websites in existence. Many websites are profit-driven, others promote unproven and even dangerous forms of treatment or products, while others may be well intentioned, but contain misleading or false information (Eng TR, 1999; Impicciatore et al 1997; Silberg et al, 1997; Kiley, 1998; Boulding and Mack, 1998; Boulding and Silber 1998; Eysenbach et al, 1998; Dyer, 1999; Adelhard, 1999; CHCF, 2000; 2001; Rodrigues, 2000c; Berland et al, 2001; Risk and Dzenowagis, 2001).

4. E-Health Strategies

The use of ICT can improve access to services and information, facilitate the operational and management of health organizations, support the delivery of quality healthcare, and be the vehicle for professional education and health promotion.

(a) Developing a National Vision, Mission, and Plan of Action

The goal is to help healthcare organizations adopt ICTs effectively by developing a health ICT vision and strategic plan of action. The immediate objective should be to promote and deploy core e-health applications and support their operation by incorporating an advanced informatics component into health programs and projects. This should be supported by a combination of funding programs, incentive grant programs, and prototype development funding programs.

Governments should focus on their role as sponsors of basic scientific and technological research and have the responsibility for assuming an active leadership role in educating the medical community and in coordinating and encouraging the effective implementation of relevant applications. In accordance with the different Diagonal Areas that have been identified in the first part of this book, it is envisioned that governments will be involved in six specific areas in e-health development and deployment:

- Promoting of education, training, and national planning capacity in information systems and technology;
- Providing funding for research and development;
- Ensuring the equitable distribution of resources, particularly to places and people considered by private enterprise to provide low profit opportunities ;
- Convening groups for the implementation of standards;
- Protecting rights of privacy, intellectual property, and security; and
- Overcoming the jurisdictional barriers to cooperation, particularly when there are conflicting regulations.

Governments must demand that international and multilateral agencies promote and support technical cooperation activities in the development of e-health. This should primarily involve the transfer of knowledge, providing technical support and facilitating the exchange of experiences between countries. International aspects of e-health form a critical and urgent area still to be addressed by the regional trade blocks and even the World Trade Organization. Health organizations must be provided with information about the opportunities as well as the risks of e-health solutions. Technology evaluation sources and results must be made available and health managers must be guided in the process of systems specification, acquisition, and contracting ICT products and services. Knowledge repositories must be established in cooperation with the industry, centers for technology evaluation, academic research groups, and centers of excellence.

(b) Bridging the Digital Divide in e-health

In the health sector, the development and digital divides between the industrialized and the Latin American countries is wider than the gap observed in other productive and social sectors. In some cases, the changes brought about by the privatization of healthcare added to the already high degree of structural inequity that prevails in the region. Only a more active role of government and public-private partnerships will create an environment conducive to a reduction of the present e-health development divide.

It is true that the developing countries of Latin America and the Caribbean may take advantage of the accumulated knowledge and mistakes and may leapfrog developmental stages. However, leapfrog strategies face great constraints due to difficulties associated with the general institutional underdevelopment, low income, and the human resources and financial constraints that trouble many countries. In industrialized countries it took several decades and countless institutional and organizational transformations for the consolidation of economic, institutional, and technological changes and the crystallization of long-term structural patterns in order that ICT could spread to vast sectors of the society. Finally, to secure an effective knowledge transfer, interoperability and language barriers need to be addressed. A serious problem for Latin America and the non-English speaking Caribbean is that many e-health applications and content are in English. Even physicians, who generally have a working knowledge of English, may have problems with this demand. Investment is required to develop user interfaces and content in national languages.

Success in the deployment of institutional e-health applications depends on the existence of staff with the right mix of skills and it rests with people in all functions and levels. Human resources development through awareness programs, education of health staff, continuous training, and career opportunities must be institutionalized from the inception of the developmental effort. This requires the transference of technical expertise and the appropriation of knowledge by health personnel to ensure the full participation of end-users in the development process and the best insurance for successful implementations.

(c) Promoting Public and Private Health Sector Partnerships

E-health solutions are complex and costly to develop and implement. Benefits are often of a qualitative and social nature and cannot be easily measured with most commonly used return-to-investment schemes. Particularly in developing countries, where healthcare is predominantly financed from public sources, market forces by themselves are not sufficient to ensure rapid development of e-health applications and universal access to ICT solutions. Technical knowledge, experience, and financial investments needed to establish complex information systems require tapping into resources and expertise that no sole organization has. The public sector alone, even in developed countries, clearly will not be capable to provide the full spectrum of "public good" e-health applications.

The answer is to embark in a concerted effort to secure a well-defined partnership with the informatics industry at the global and national levels aimed at application development, deployment, and support at acceptable cost and, at the same time, creating commercial opportunities that are attractive to technology firms. Public and private institutions, academic organizations, industry, and financing agents must find ways to pool their assets through project partnerships and quickly add social value to cost-effective health services (PAHO, 1998; 1999; 2001).

(d) Standards

Work must be carried out with the public and private sectors to achieve consensus on a set of information principles for the collection, transfer, storage, and use of health data over national and global information infrastructures (WHO, 1998; PAHO 1998; 1999). Data-, process, and technology-related standards will be defined by a consortium of users, researchers, government, technical and scientific bodies, and the industry at three distinct levels. These are the standardization of data and information, the computational facilities required to manipulate and store the information and telecommunications facilities, employed to transfer information among dispersed sites.

From a healthcare standards perspective, the area of standards is in constant flux and one must be attentive to the evolution of international recommendations and professional standards working groups. It is therefore advisable to carefully evaluate existing options regarding technical guidelines, norms, and standards developed by the international technical and scientific community, particularly the ones validated by the International Standards Organization (ISO), a worldwide federation of national standards organizations. Policy and regulatory norms are needed but if approached rigidly they may inhibit and complicate the delivery of innovative technologies and applications while more attention should be paid to how technical ideas are made accessible to potential users.

(e) Creating Incentives Through Regulation

To be fully effective and efficient the healthcare industry must operate in a seamlessly integrated digital environment encompassing connectivity, applications, content, commerce, and the community of stakeholders. But no one can pinpoint exactly how everything should converge. Using regulatory powers to nudge the health industry toward compliance with the standardized definitions and processes needed to accomplish that objective is a valid and effective approach. The European and Canadian healthcare systems have used this strategy and HIPAA —the U.S. federal Health Insurance Portability & Accountability Act— is a prime example of how the industry can be coached into complying with a variety of guidelines related to data standardization, security, and privacy. In effect, HIPAA is forcing an e-health solution on U.S. healthcare insurance and reimbursement processes. The HIPAA regulations cover both physical and electronic security to virtually every company involved in healthcare including health plans, providers, payers, clearinghouses, and employers. The rules apply at the time patients make appointments with their doctors who determine eligibility electronically; when a patient checks into a hospital and his or her information might pop up on a computer monitor; or when patient records are transferred via the Internet for review from one medical provider to another. Although the new provisions mean major expense in the short term, the intent is to simplify processes, bolster security, and cut costs in the long run.

Latin American and Caribbean countries can profitably use those experiences in the development of regulatory mechanisms that will provide the incentives to convince the health industry in deploying efficient and cost-effective e-health applications that will move the healthcare system forward and result in real improvements in patient care and clinical practice.

The introduction of e-health offers a great opportunity for the acceleration of the development process toward universal, high-quality, and cost-effective health services in Latin America and the Caribbean. Despite the central importance of the health sector for overall sustainable development, health is clearly lagging behind in the omnipresent process of digitization. The widespread adoption of ICTs by the health sector will require special attention of public authorities and health decision makers in the process of building a Latin American and Caribbean Information Society in the years to come.

D. E-Culture[21]

The so-called digital divide is not only material in nature, it is also a symbolic abyss, representing inequitable distribution of the knowledge and cultural goods required for an individual, culture or society to be integrated into a globalized information society.[22]

In view of this situation of cultural exclusion, research is needed into the sociocultural impact of the Internet on cultural and material consumption habits in the Region, where a selective process of Internet expansion is taking place. This expansion is combined with a mass consumption of the symbolic television products or messages , accompanied by a process of material impoverishment reflected in an abrupt drop in the income of the population (Hopenhayn and Ottone, 1997).

From this point of view, research into the sociocultural impact of ICTs is useful to guide the design and implementation of public policies relating to Internet communication and culture. Such policies are aimed at reversing to some extent the realities and trends towards cultural and material exclusion that are being witnessed in the Region.

This Section covers the critical elements that should be considered

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[21] This Section is a contribution of Mr. Marcelo Bonilla Urvina, coordinator of the research program on the social impact of the Internet in Latin America and the Caribbean, FLACSO, Ecuador Headquarters.

[22] "From the political point of view, the growth and dissemination of information technology and electronic commerce seem to be dividing the world in a new way, not by political ideologies, or nation states, but according to possession of and access to knowledge. The social and economic classes of today transcend the frontiers and are forming horizontally and on an international scale within a more global model that isbased on the Network. The new dividing line seems to be forming between those who possess knowledge, in other words, efficient access to the Internet implying that those who have it can communicate and interact increasingly with each other, gradually developing common values, life styles and consumption patterns throughout the world without moving from their computers, that is, their usual physical location." (Latin American Integration Association (ALADI), 2000).

while studying and designing public policies on Internet communication and culture geared toward greater social and cultural equity in the region.[23]

1. The instrumental vision of technology

One of the general observations from research on the social impact of the Internet on school culture, citizenship and governability in Latin America and the Caribbean, is the predominant tendency toward a merely "instrumental" and "technical" implementation of this digital tool.

The predominance of instrumental perspectives of the Internet often overlooks the potential the Internet has as a language and representation system through which young people and citizens can create and re-create narratives, their visions of themselves and society (Cabrera, 2001). Presently most projects forget the social dimension and function of ICTs as part of the processes of production, consumption and distribution of knowledge. This lack of integration is reflected in the ritual uses established by school authorities as indispensable rules for students' access to computers (for example obliging children to cover their shoes with plastic bags before entering the computer room, procedures for switching the computers on and off, covering them, etc.).

These patterns reflect a perspective that officially sanctions the Internet, but at the same time reduces it to just one more technical instrument of the school system. Consequently preference is given to technical learning (treating the computer as a data and information base, or an encyclopaedia) rather than to its potential as a communication tool. The outcome is that the Internet is restricted to traditional teaching methods and learning practices (such as the reproduction and copying of texts without an investigative and critical approach) which are obstacles to the development of a more participatory and creative learning process. The virtual classroom thus becomes a space which reproduces traditional forms of learning and vertical power hierarchies which are typical of the Latin

[23] This analysis was based on the information and conclusions from eight research projects carried out between 1999 and 2001, as part of a competition for research projects on the social impact of information and communication technologies (ITCs) in Latin America and the Caribbean, held by the Latin American Faculty of Social Sciences (FLACSO-Ecuador headquarters) and the International Development Research Centre (CIID /IDRC, Ottawa, Canada).
This programme covered priority areas of development such as: education and culture, democracy and citizenship, law and justice, and methodologies for evaluating the social impact of the Internet. http://www.flacso.org.ec; http://www.idrc.ca/pan/panamericas_s.htm, http://www.idrc.ca/pan/pr04439_s.htm

American schooling system (Arredondo and others, 2001).[24] These ways of reducing ICTs to a tool within a dominant cultural order mask and destroy the possibility of developing new relationships, teaching methods, communication processes and forms of learning.

Similar phenomena of instrumental implementation occur in experiments in applying ICTs in the area of local government (municipality), where the Internet has played only a traditional role in spreading information, such as an information bulletin, in promoting governments and traditional images of leaders. The Internet has certainly not been considered from the point of view of developing a culture of citizens' participation, or "cybercitizenship", a situation which has strengthened clientelist practices.[25]

The prevailing instrumental view of seeing the Internet as an object that is outside the context of cultural changes, power relationships and changes in symbolic and knowledge circulation systems means that new approaches, methods and teaching practices must be developed and applied. Only by doing so will it be possible to form new social practices for perceiving, acting and participating in society through an innovative use of ICTs meaning incorporating them into the school system and the citizen culture.[26] In other words, it is essential for public policy to use the Internet to encourage the creation of a new citizen "habitus".[27]

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24 Miguel Angel Arredondo, Ramiro Catalán and others (2001) describe in detail how traditional teaching methods are reproduced through the ritual uses and instrumental practices of the Internet in the school system of the Maule Community (Chile).

25 Susana Finquelievich, Silvia Lago Martínez and others (2001) offer a detailed description of the instrumental use of the Internet at the level of the governments of Buenos Aires and Montevideo as a way of reproducing traditional local forms of administration and exercise of power. Uca Silvia (2001) gives a detailed description of how the use of ICTs in the Chilean municipalities of El Bosque, Puente Alto, Los Andes and Rancagua have only met the internal needs of local governments to improve internal information services, political marketing and the reproduction of clientelist power relations.

26 Along these lines there is the work of the team at the National University of Quilmes which deals with a proposal to create a new habitus in the citizen (Schiavo, 2001). This group of researchers developed a multimedia tool or application based on an evaluation of the local experiences of electronic government in Argentina. The tool was designed to encourage a habitus of children 's participation through their relationship with their local environment in order to overcome the instrumental practices and traditional vision of the Internet. Another relevant experiment in the same area is the one carried out by the MISTICA Virtual Community, launched by the Networks and Development Foundation (FUNREDES, Dominican Republic) FUNREDES' objective is to develop a cyberculture based on principles and practices of solidarity and democratic participation among its members.

27 "Habitus", as defined by Pierre Bourdieu, is understood as "the system of attitudes... generating and organizing principles of practices and representations... collectively orchestrated" (Bourdieu, 1991) which orders everyday practices.

It is also important to conduct research on the social impact of ICTs on the dynamics of reproducing material and cultural capital and the process of continually transforming material goods or assets into symbolic goods or assets.[28] Research in these areas may provide a clearer vision of how ICTs function in the current context of a globalized world, and how to implement policies using new teaching and learning methods to counteract the current predominant trend that polarizes social and cultural differences.

There are clearly two contradictory trends or visions of ICT implementation in school, cultural or local government management projects. There is the dominant view, which sees the Internet as a technical tool, and the other perspective, which attempts to salvage the Internet's potential as a system of communication and representation of new forms of learning and social participation. These two trends form part of a more complex process in which two currents collide. One reproduces traditional forms of dominance or power. The other subverts this order and points to a new form of learning outside traditional systems of education and the established order, in areas outside school and in spaces where new forms of interaction and socialization are emerging. Some reflections on the collision of these two currents are discussed below.

2. New cultural proposals

The Internet alone does not generate changes, as it exists within the cultural, political and social orders and contexts, and usually becomes an appendix or extension of institutional power. In the field of education in Latin America, some case studies have indicated that there is a trend toward reproducing the punitive school system through the use of ICTs. In general, the Internet is reduced to the traditional forms of school control and power (Cabrera, 2001; Arredondo, 2001).[29]

It has also been observed, however, that the virtual classroom may be transformed to the extent that the teacher loses authority, as the dynamics of the informal exchange that is generated during the practical computer sessions neutralize and diminish the teacher's capacity for control. In this

[28] This thought uses the theory of symbolic and material capital developed by the French sociologist Pierre Bourdieu (1991).

[29] Cabrera (2001) and Arredondo (2001) provide a detailed ethnographic description of how the Internet is linked to school discipline, how in the virtual classroom punitive school practices are reproduced which are indicative of resistance on the part of the teaching staff and the education authorities to implementing profound changes in the teaching systems.

sense, the virtual classroom is a point at which the playful activity of the students and the vertical authority of the teacher collide. The virtual classroom, through the windows of the computer, thus becomes a means of escape from the teacher's control. The Internet marks the limit between the experience within and outside the classroom, within and outside the educational system. This point of conflict also reflects the tension between the culture of the book, understood as a form of relationship, of pedagogical control of the student, and new forms of learning by navigation through cyberspace. Young people navigate outside school premises and far from the control of the teacher, through practices which combine televisual codes, sound, reading and the use of "chat" as a new form of socialization and construction of new identities (Cabrera, 2001).

One key factor for achieving optimal integration of the Internet in the life of young people and citizens, and overcoming the duality described, is to directly link the use of this new technology to the needs and areas of local cultures.[30] That is, to take into account the local dimension as a strategic element in the design and implementation of projects aimed at socially developing ICTs with a view to generating social practices and an Internet culture which allows a horizontal and equitable exchange of knowledge.

The lack of incorporation of ICTs in school and citizens' culture in the Region is the result of a lack of an integral pedagogical proposal, that forms part of a larger proposal for a profound change in the relationships and methods of teaching and learning. This points to the need for proposals and actions which encourage new civic teaching methods for ICTs (Robinson, 2001), undertaken within a new school culture, as a basis for constructing more participatory and just societies in Latin America and the Caribbean (see also the Section on e-learning).

3. Fair and equitable orders

An important initiative to be taken in the public policies of Latin American countries is the development and consolidation of the right to

[30] The evaluation by Vilela and Light (2001) of two positive cases of ICT inclusion in two rural schools in Argentina concluded that success depended on the capacity to integrate the Internet with the needs and areas of the local communities. In other words, the capacity to link educational projects to local management actions. This paper describes how students of one rural Argentine school in the Tanti community (Córdoba province) shared experiences and carried out joint actions with students from a similar establishment situated in a distant region of the same country in order to implement a reforestation project in their local area.

communication and culture. This includes the right to the Internet as a fundamental axis which ensures equitable access to ICTs and citizens' participation. This is a central objective to be included on the agenda of civil society organizations (CSOs), whose activities are aimed at developing social policies in different fields (health, education, local development, women's rights, cultural rights, etc.).

Uca Silva (2001) explains that one essential requirement for exercising the right to citizenship is exercising the right to communication, which is the basis for establishing the link between the government and citizens, as a participatory relationship in which the citizen has the opportunity to see, listen and speak. In other words, the right to communication should be established as a horizontal relationship which, allows citizens participation.

This new principle and right should therefore become the basis for all regulations concerning the exchange of knowledge, the exercise of public rights and freedom of expression through ICTs. This new technology should be conceived as a tool and a form of language which when applied can help the development and implementation of social policies (education, health, social security, local development, scientific development, human rights, citizens' participation, etc.) (Martínez, 2001).[31] It should be noted that applying the logics of communication horizontally, which may be done with help of the Internet, would not only help to improve levels of political participation, but also make local management and social policies more transparent.

On this premise, the right to communication and culture can be understood as a guarantee that the opinions of citizens, both men and women, will be heard and taken into account in the running of the government and political decision-making. It guarantees that they will receive reliable, honest information on the social actions and policies carried out by the local or national authorities. This guarantee also includes the right to political participation through free access to information and knowledge. The implementation of this new principle should be supported by the effective exercise of the "Internet Right", which is a collective guarantee that includes the possibility of physical access to the ICTs as well as learning and social appropriation.

Nevertheless, the right to communication and culture, through the Internet Right, should take into account a balance between a collective right such as the free circulation of knowledge and information and private rights

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31 Martínez (2001) explains the crosscutting nature of using the Internet as a condition for improving the quality, timeliness, transparency and citizens' participation in the construction, management and implementation of public policies.

such as those that protect the intimacy and privacy of the individual and those relating to intellectual property.

On the one hand, the lack of institutions, regulations and political culture to protect the privacy and intimacy of individuals may lead to situations in which people feel insecure using the Net. For this reason countries should reach regional agreements in these areas in order to construct an Internet culture based on transparency and respect for personal rights regarding the management and use of digital information.[32] On the other hand, it should be made clear that excessive limits put on the spread of intellectual content could cause stagnation in development. Limits could generate inequitable relationships which impede technological, educational and cultural development in the Region, which is why a balance should be reached between the lawful use of intellectual property and authors' rights.

As can be observed, a regulatory model which allows equitable access to and appropriation of the Internet should be based on a right to communication and culture and include balances between individual rights such as the privacy and intimacy of the individual and social rights such as the free dissemination of knowledge. Such a legal model, necessary for the development of equitable relations in access to knowledge, culture and the exercise of citizenship, can only be achieved by encouraging regional agreements and strategic alliances between civil society organizations (CSOs), the academic world, the private sector, and national and local governments.[33]

4. The construction of an internet culture

As a final conclusion to these reflections it can be said that to build an Internet culture that ensures access, appropriation and use with social understanding of ICTs will depend on the convergence of three processes and lines of action which should be encouraged. They are (1) the

[32] The research team of the Institute of Justice Research (Argentina) warns of the danger to citizens in societies and states lacking democratic practices. These could lead to possible violations of basic human rights which may arise owing to the indiscriminate use of personal information (regarding health, finances, political or religious affiliation, etc.) (Gregorio et al, 2001).

[33] Both Martínez (2001) and Robinson (2001) emphasize the need for strategic alliances aimed at implementing social policies and projects related to ICTs. Finquelievich and others (2001) underscore the need to encourage the collaboration of civil society organizations, the academic world, and the governmental sector in the development of social and technological policies for cities.

construction of a new vision and practices (habitus) for the Internet; (2) the establishment of new strategic alliances between bodies and individuals in civil society organizations, the private sector, the academic world and the government sector (local, regional or national) with the aim of achieving social development of ICTs (both in collective access and in the social use or appropriation of this tool), and (3) lobbying by the civil society organizations and citizens for consolidation of the right to communication and culture and the right to the Internet both in everyday practice and at the level of explicit inclusion in national, regional and international legal systems.

(a) New vision and the Internet habitus

Studies on the social impact of the Internet in Latin America have shown the need to relate to the concepts and practices of culture and citizens' participation as the key for designing development projects that use them. That is, the current issue concerning ICTs relates to the topic of connectivity (physical access), and concerns the issue of use and appropriation of a new language and development tool for groups of citizens and CSOs.

At present the majority of initiatives being studied are divorced from the reality of the local culture and have been instrumentalized and adapted to the traditional forms of exercising power. This situation is reflected in the existing abyss between school and local reality, between current teaching methods and the needs of the community. There have been signs of rationales in the school systems and in the dynamics of local governments that tend to perpetuate forms of exercising power and local management that do not lead to true citizens' participation. These rationales are an obstacle to the building of an Internet culture based on a right to communication and culture. A new vision and practice (habitus) of the Internet must be based mainly on the development of new civic teaching methods.[34] These new teaching methods must start at the base of the schooling system and structure of local organizations (districts, communities, etc.).

Using the Internet for social ends should be developed on the basis of this educational linkage which connects local, regional and global dimensions. The new teaching methods constitute forms of learning, perceiving and acting through a new medium of communication and exchange of knowledge, supported by the strategic use of the Internet. This

[34] This term is used to refer to a learning process and methodologies aimed at developing participatory processes that help to link electronic government initiatives, incorporation of ICTs in the school system, etc. with the needs of local cultures (Robinson, 2001).

educational reform should also be included as part of the agenda of projects which are carried out at various social levels and scales, from the development of educational projects at the school level and proposals for electronic government to experiments in building virtual communities.

(b) The Right to Information and Culture, and the Internet Right

> "Universal Declaration of Human Rights"
>
> Article 19: "Everyone has the right... to seek, receive and impart information and ideas through any media and regardless of frontiers."
>
> Article 27: "Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits."

Undertaking projects to promote the social use of the Internet requires formal recognition from constitutional systems, national laws and international legal instruments of the right to information and culture. It also depends on the Internet Right, which at the level of national states and local governments should take the form of a crosscutting policy that affects all other social policies.

Such recognition will only be possible if CSOs and citizens' organizations interested in the development of public policies (health, human rights, political participation, education, etc.) include in their political agenda the consolidation of the rights already mentioned. Those rights are the fundamental base or prerequisites in the globalized world to ensure the exercise of citizens' guarantees that form part of contemporary national and international legal systems such as freedom of expression or political association.

The right to the Internet should include collective physical access to ICTs, as well as facilitating learning and their usage for social reasons (which allows them to be included in the school culture, the community and in local governments) according to the existing circumstances in each country, region and locality. This right should constitute the basis for constructing a political culture based on citizens' participation, especially for social groups that have traditionally been excluded (for reasons of race, ethnicity, gender or generation).

The legal models to be applied in Latin America and the Caribbean to the Internet should primarily meet the needs and circumstances of local cultures. On the other hand, regional agreements and treaties should harmonize the free circulation of information and knowledge with the rights to privacy and intimacy, and the lawful use of intellectual property. For the Region to achieve an adequate level of integration in the globalized world, these two currents, the one that promotes free access to information and the other aimed at protecting individual and intellectual property rights, must be harmonized.

These new collective rights can only be achieved by strengthening citizens'organizations, CSOs and the alliances that the latter can generate with the private and governmental sectors in each locality, region and country. This building of alliances will depend on the individual political and economic scenarios, and on the negotiating talent and initiatives of those groups.

(c) New alliances and political actions

In summary, the goals discussed are the development of a new vision and practice (habitus) towards the Internet and the inclusion of the Internet Right in national and international legal systems as part of the right to communication and culture of different citizens. These goals can only be achieved through the action, initiative and collaborative work of CSOs, citizens' movements and organizations involved in social development and learning research about ICTs.

These groups, in addition to including the development of ICTs on their internal agendas, should encourage alliance building, which is currently non-existent, with entities in the private sector (including, but not limited to, the large telecommunications companies), and the local, regional and national government bodies.

These agreements would have to reflect a new political culture (vision and habitus) in relation to the social commitment that the private and government sectors have to assume in order to encourage the social development of the Internet Right. This commitment depends on the negotiation capacity that the CSOs and citizens' movements can develop in order to achieve the involvement of these sectors and their linking to the needs of different local cultures.

The momentum of this process also depends on the strengthening of CSOs and citizens' movements and their capacity to get involved in local, national and regional contexts. The alliances, solutions and formulas that are implemented to encourage social development of the Internet depend on the particular situations of each country and region.[35] That is, there are no fixed or unique formulas or models for Internet development; they depend on the context in which they are applied.

E. E-Learning[36]

No one today can deny that the use of Information and Communication Technologies (ICTs) in the formal school environment is a positive and even necessary step, in a world that is increasingly being affected by these technologies in various areas of the social system. The versatility and capacity of these technologies makes them an effective support mechanism for teaching and learning and developing and managing certain organizational routines in schools.

1. ICTs and schools: Theoretical Perspectives

As a complement to the previous Section on "human capital" and the education of the work force in ICT applications, this Section focuses more on the opportunities for supporting the teaching process through the use of ICTs, and on the changes needed in the teaching paradigm. The Section addresses three perspectives which although they are different in theory, they are not necessarily mutually exclusive in practice. The three currents are (i) those focusing on the benefits of ICTs for learning (education through ICTs); (ii) those linking the introduction of ICTs into schools to the demand for appropriate human capital in the Information Society (education about ICT); and (iii) those that link ICTs to changes and innovations on a larger scale in schools (administrative management, teaching practice, etc.) (ICT paradigm).

(a) ICTs and learning

Quite a number of research projects and studies have focused on ICT potential to complement the teaching and learning process. According to this theoretical research, ICT-assisted learning and teaching have a real and specific impact on a series of conditions that encourage significant learning processes (for example encouraging motivation to study), (Papert, 1994). Also the use of ICTs in education has a direct impact on learning in certain areas of knowledge. It is argued that ICTs help people to understand key concepts in subjects such as science, mathematics and language by representing these concepts and subjects in simpler and more understandable ways. At the same time, the capacity of ICTs' to interact, simulate, visualize and model

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35 Martínez (2001) distinguishes between political contexts or scenarios in which the State has greater involvement in public policies for the Internet and others in which the private company is more active.

36 This Section is a contribution from Felipe I. Jara Schnettler, Sociologist, M.Sc.; Consultant in Management of Technological Innovation.

these concepts-to name but a few- would help to improve significant learning processes.

Along these lines, it is argued that cognitive research has demonstrated that learning is more effective when some of the following four characteristics of the process are present: commitment and active participation; learning through group participation; learning through frequent interaction and feedback; and learning through connections to contexts in the real world. Roschelle (2000) notes that in each of the latter, ICTs play or have the potential to play a fundamental role.

(b) Information Society: Integration and Development

From the perspective of the Information Society, the need to use ICTs in schools —which are intended to produce individuals who are ready to participate in society and contribute to the economic and social development of their nations— is fairly self-evident. The theoretical background to this line of thought contemplates, on the one hand, the need to develop technological capacities in the population as a means of increasing the international competitiveness of countries, and thus their global development (Brunner, 2001; Mansell, 1999); and, on the other hand, the need to bridge the Digital Divide, not only between countries, but also within countries (Hilbert, 2001a; UNDP, 2001).

These policies focus on the qualification or training of teachers and students (computer literacy) that is designed to ensure a basic mastery of the technologies installed in schools (see Papert, 1994). There is also emphasis on the role of ICTs as a support tool that develops the basic competencies needed to survive in the Information Society. These include critical thinking, problem solving, and a higher order of thinking skills, etc. Therefore, any investment in training and installation of ICTs in institutions that are as important for society as schools, is highly justified.

(c) Innovation and change in schools

The third perspective concerns a holistic vision of ICTs in education in relation to the broader theme of innovation in education. Here introducing ICTs is seen in the light of innovation and change in schools, and must be discussed in reference to all the relevant literature and categories relating to the areas of change and innovation in educational contexts in general (Fullan, 1992; McDonald and Ingvarson, 1997; Olson, 1998). From this point of view, the idea of using ICTs as motors of innovation and change in schools should be understood in the context of various elements. These include schools and their aims, the relevant authority and power, environment, teaching processes, etc. The authors argue that the key factors for bringing about educational change are: introducing and strengthening the use of new resources, developing and facilitating the use of new methods; and modifying professional beliefs. In fact, according to a prerequisite for bringing about changes in the schooling system has to begin with the commitment from the teachers and the subjective world of teaching methods.[37]

As can be seen from this theoretical point of view, to successfully introduce ICTs into the schooling system requires more than just installing technological devices and training teachers and students to have certain capabilities. Moreover it is necessary to take into account a complex series of changes and transformations that ICTs can produce in a school by merely being present or are capable of producing with the suitable methodological and organizational support.

2. The Enlaces program in Chile: from philosophy to practice

In the fields of academic and policy management there is little conformity about the roles that ICTs should play in schools (what to use them for?), the best ways of introducing them efficiently (how to include them?) and their real impact on education (what is achieved?). There does not seem to be any prescribed method. Instead, the uses and means of introducing ICTs depend on the objectives of each program and country. They depend on the nature of the educational systems (for example, the degree of centralization in the management of schools), and the particular needs, institutional uncertainties and educational demands that define them.

This Section analyzes these complexities comparing them to the development and impact of the Enlaces Program of Chile's Education Ministry. In its nine years of operation, Enlaces has built up a significant amount of knowledge and experience in introducing ICTs into the school environment. Other countries in the region wishing to introduce similar programs can learn valuable lessons from these experiences.

Various international organizations have described the Enlaces Program as a "world leader in using advanced ICT to improve educational outcomes" (OECD/UN/UNDP/Worldbank, 2001). It would therefore be useful to analyze in detail the philosophy, strategies, impacts and challenges of this Program. In order to gain support for putting ICTs in schools onto

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[37] Along these lines, Fullan and Stiegelbauer (1991) claim that "educational change depends on what teachers do and think —it is as simple and complex as that" (p.117). Cited in Hinostroza and others (2000).

the Latin American agenda, it is necessary to pay special attention to those variables that facilitate or restrict the positive impact of these technologies in schools. On the one hand, it is necessary to take into account the macro level of design, implementation, development and management of ICT policies for schools.[38] On the other hand, other variables on the micro level of existing dynamics and inertia to change in schools should be considered. Schools need to be seen as organizations which are part of a larger system (the education system), governed by and consisting of a wide range of actors (sponsors, directors, teachers and students).

(a) Background: Educational Reform

For about a decade Chile's Education Ministry has been implementing educational reforms aimed at improving the quality and quantity of education in subsidized schools in the country. This educational reform began as a response to two factors. Firstly, they were designed to address the problems of the imbalance in quality education in state and private schools which was detected at the beginning of the 1990s, and was seen in low levels of learning shown by the Education Quality Measurement System (SIMCE)[39]. The deficiencies of the system were reflected in low quality of the educational services supplied is some schools, relatively few progress reports, out-dated curricula, and an unbalanced emphasis on the needs of the productive industry and the needs of society, etc. Secondly, the reforms were a response to the role that education is required to play in contemporary society. Education should be coherent with the needs of society within which it takes place. It needs to be flexible and to produce creative human resources that are increasingly faster at managing information.

Responding to those two needs, reforms have been carried out in four areas. They include programs to enhance quality, equality and participation in the education system, review the national curriculum, strengthen the teaching profession (initial training, improvement, work performance and working conditions, etc.) and introduce the full school day. The Enlaces program is one of several programs aimed at improving the quality and equity of Chilean education.

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38 The term "schools" shall be used in a generic way, referring both to primary and secondary education.

39 "SIMCE is a standardized test that gathers objective information by measuring cognitive learning in mathematics and language and, in more recent years, understanding of the natural and social environment. In primary schools the measurement takes place in the 4th and 8th grades, and is applied alternately at each of those levels. The test was also applied in the 2nd grade of secondary education in 1995 and 1998. The test is applied to all establishments and pupils at the appropriate grade for the year..." (Asesorías para el Desarrollo, 2000).

(b) Enlaces Program: philosophy, strategies and results

The Enlaces Program aims to use Information and Communication Technologies to provide all subsidized schools in the country (see table) with the necessary knowledge and resources so they can offer quality and equal education for all. Since its inception, Enlaces' mission has been to provide these resources and to use them to help implement the new curriculum, by training teachers in the educational use of ICTs.

SUBSIDIZED ESTABLISHMENTS AT NATIONAL LEVEL

Level of Education	Schools				Enrolment			
	Urban	Rural	Total	%Rural	Urban	Rural	Total	%Rural
Primary (P)	4.004	4.677	8.681	54%	1.885.846	337.714	2.223.560	15%
Secondary (S)			1.442	0%	716.203	26.159	742.362	4%
P + S			9.496				2.913.395	
Total Teachers	144.377							

Source: MINEDUC (Ministry of Education) statistical compendium

Enlaces is coordinated jointly between the Education Ministry and the *Instituto de Informática Educativa* of the *La Frontera* University. Together, the University and the Ministry coordinate the teaching and technical aspects of the program. In addition, in the area of Program management, Enlaces works with a network of 24 universities that carry out teacher training programs and other activities that are assigned by the central government.

Enlaces has managed to reach 74% of primary and 93% of secondary schools (see table). It has trained more than 54% of the teachers (see table), so that over 90% of the pupils at subsidized schools have access to the new technologies (see table). Around 43,000 computers have been provided (see table), which has made it possible to reach an average figure of 65 pupils per computer. Enlaces has equipped all of those establishments with productivity software (Office type) and topical educational tools, for science, history, language, geography, etc.) Similarly, by the year 2000, 74% of the establishments participating in Enlaces had Internet connections.

ENLACES COVERAGE IN RELATION TO ENROLMENT
(TOTAL NUMBER OF STUDENTS) PER YEAR (CUMULATIVE)

	before 1998	1999	2000	2001
Primary	48%	61%	85%	93%
Secondary schools	81%	95%	96%	96%
Total	56%	70%	87%	93%

Source: Enlaces Program

AVERAGE NUMBER OF PUPILS PER PC, PER YEAR

	1998	1999	2000	2001	2002*
Ratio of Students per Computer	71	67	70	65	56

Source: Enlaces Program; *Estimate.

(c) Enlaces and its strategy

Seven elements have been used to describe Enlaces' particular way of implementing its national educational technology program. These elements are:

- Technologies serve various purposes in schools and are a support medium for teaching rather than an end in themselves;
- Teaching flexibility is required for introducing ICTs in education;
- The incorporation of ICTs in schools through an "educational informatics" laboratory, where users can come for classes, self-study, etc.;
- Focus on the teacher as an agent of change;
- Formation of links with organizations outside the school system;
- Importance of appointing a coordinator for the educational informatics laboratory;
- Importance is attached to technological networks and networks of individuals.

In the following sections we shall consider each of the above elements.

i. Technologies serve various purposes in school and are a support medium for teaching rather than an end in themselves

Since its inception, the Enlaces Program has emphasized the broad role of technologies in schools. Technologies have an educational, administrative, professional and social role, which is mainly defined by the actors who need and use them, whether they are teachers, students or school directors (Hepp, 1998). As for the teaching role, the Program has emphasized from the beginning that ICTs are an additional and complementary resource in the process of teaching and learning and not a resource intended to replace others. From this point of view, ICTs take on greater relevance and meaning when their purpose is educational (in the broad sense). Therefore the Program has tried not to limit ICT use to "computer classes" or for use only by experts or specialized personnel (Hinostroza, 1999). On the contrary, the uses of ICTs are varied and open according to the needs of schools and their particular educational projects and social, geographical and cultural contexts (Hinostroza and others, 2000).

ii. Teaching flexibility is required for introducing ICTs in education

Unlike some programs in the region, such as the experience in Costa Rica (Ceballos, 2001), Enlaces has not committed itself to any single teaching model. Since its inception it has preferred to employ a variety of teaching and methodological models for the use of ICTs in schools. The Program is thus open to the individual dynamics of the schools where it is used.

iii. Importance attached to technological networks and networks of individuals

The Enlaces Program, or, as many call it, the Enlaces Network, began with the aim of creating a network of individuals, who could communicate and collaborate for educational purposes through these technological networks. This partly explains why Enlaces helped to develop a user-friendly software called *La Plaza*, which was provided (until 1998) to establishments participating in Enlaces. The idea was to establish telematic links with other schools and institutions by email, at a time when the Internet was not yet fully spread to all social levels. Since telecommunications company Telefónica CTC began providing Internet connections in 1998, the use of *La Plaza* has gradually diminished, and the Internet has come to be used more as an information network (the Internet as a great centre of information resources) rather than a communication network. From this perspective, Enlaces continues to provide schools primarily with a port of entry (or exit) to the Information Society and its wealth of information and knowledge (Hinostroza, 1999).

iv. Incorporation of ICTs in schools through an "educational informatics" laboratory, where users can come for classes, self-study, etc., using multimedia PCs with productivity and educational software

Enlaces has been gradually installing a computer room or laboratory in each school, with hardware and software and Internet connections in primary and secondary schools.[40] The number of laboratories in each school are installed according to the following distribution and equipment assignment categories:

CLASSIFICATION OF ESTABLISHMENTS BY ENROLMENT

Equipment	Small (< 100 pupils)	Medium (100 – 300 pupils)	Large (> 300 pupils)
Computers	3	6	9
Printers	1	2	2

Source: Enlaces Program

The Education Ministry has called public auctions each year to obtain equipment, electrical and data networks, furnishings and software for the Enlaces laboratories. It is the responsibility of the private company that wins the call to tender to completely install the equipment.

Once an educational establishment has been incorporated into Enlaces, in addition to the basic equipment, it starts to receive on an annual basis various types of educational software designed to fit the school curriculum (see Box below). The schools also receive additional support materials for an in-depth study of the educational uses of the technologies (journals, brochures, manuals, web sites, murals, etc.).

[40] As will be seen later, it should be mentioned that since 2001 Enlaces has been introducing ICTs in rural schools in Chile, which usually have computer equipment installed in the classroom, rather than in a special informatics room.

EDUCATIONAL SOFTWARE 2001

In 2001, the software supplied to Enlaces establishments included:

KID PIX: a drawing and painting program designed to develop student creativity and written expression.

Skills that can be developed by using this software: favors the development of creativity using plastic expression and language; effectively encourages the capacity for communication in oral and written form; develops the capacity for sequential planning through the design of animated stories, etc.;

The Happy Prince: multimedia version of the Oscar Wilde fairy tale. This introduces children to the world of literature classics.

Skills that can be developed by using this software: encourages narrative invention, creativity and imagination; develops the capacity to produce short and simple texts; encourages and promotes moral and ethical values; encourages enjoyment of literature.

Source: Enlaces Program

v. Focus on the teacher as an agent of change

The Enlaces Program has attempted to achieve its goals through the teachers. This is in keeping with the view that ICTs will only have a positive impact if the teachers are able to integrate the technology into their daily teaching schedules (Hepp, 1998). Teachers make use of PCs according to their needs, and for that reason one of the main strategies of Enlaces has been to train the teachers to use them.

As well as installing the equipment, Enlaces provides intensive training programs to groups of 20 teachers per school, over a two-year period, in addition to on-going basic technical assistance requested by the schools themselves. The first year of training focuses on basic management of the hardware and software, while the second year is concerned with the pedagogic use of the resources supplied (see Box below).

The process of training described above is carried out by a network of universities, which are contracted by the Education Ministry. There are six Zone Centers in the country, to which the Ministry mainly relates in this task. These Zone Centers are associated to other institutions of higher education ("Executive Units") in order to expand their radius of action in the geographical area assigned by the Ministry. Today, a total of 24 universities are involved in providing technological training to Chilean schools. This network of universities shows a strong institutional will to

THE PROCESS OF TRAINING AND TECHNICAL ASSISTANCE

The training, based on working with teachers, includes the following stages: preparation, first and second years of teacher training as well as training of teachers who will act as school coordinators and technical computer support services assistants. In the third year the period of on-going basic assistance begins, which helps to keep the technological resources updated and maintains a permanent link with the Enlaces Network.

Preparation. This stage of technical assistance takes place between the incorporation of the establishment in Enlaces Network and the beginning of teacher training. At this stage the Enlaces Network is presented to the management and teachers of the school and provides them with information regarding Enlaces' objectives and the Technical Assistance Plan that the Zone Center or Executive Unit will carry out in the school. During this phase, the timetable and methods for training of the teachers should be agreed.

Teacher training, year 1. This stage begins when the computer room is fully installed. The aims are to introduce the teachers to the computer resources, to familiarize them with the computers' main functions, and to train them in communications applications.

Teacher training, year 2. The aims are to study the first-year contents in greater depth and promote the pedagogical and administrative use of the computer resources, as well as encouraging autonomy in maintaining the computer room.

Assistance for coordinator teachers. When joining the Enlaces Network each establishment should assign one or more teachers a number of hours for Enlaces "co-ordination" tasks. As part of the training of technical assistants teachers are also given training and advisory activities to do.

On-going Basic Assistance. The aims of this service are to provide operational maintenance for the technological resources in order to strengthen the ability of schools to actively make use of the technology in curriculum development and to maintain a permanent link with the Enlaces Network.

Technical computer support. The technical computer support includes services relating to the operation of the Enlaces room and maintenance and configuration of the operating systems, communications services, productivity tools, etc. that are provided to the establishment. This assistance is provided during the first two years of training and during the period of on-going basic assistance in the third year.

Source: www.redenlaces.cl

decentralize the educational system. The network connects schools and universities (which have traditionally been separated, with little contact between them) and universities are given an important role in the development of the country (Ceballos, 2001).

The Zone Centers receive certain general guidelines from the Education Ministry and develop appropriate training programs accordingly. With the general framework defined in this way, the Zone Centers have the opportunity to put different emphases on this process. Compliance with the guidelines or minimum standards is evaluated annually by the Ministry.

This mutually beneficial relationship between universities and schools forms a “virtuous circle” (Hepp, 1998) with a trainer network of 1000 teachers operating, 90% of whom work as school teachers, and who now have a more advanced knowledge of the use of ICTs in education than before. Seen in this way, there is a spontaneous link between these two important educational agents in the country.

The Zone Centers are a natural location for carrying out research and development and in general reflect the extent of ICT use in education in the country. However, they do not always enjoy the financial and administrative independence needed to make them pro-active and innovative centers for applying ICTs in education (Hepp, 1998). As a result, a large number of them are strictly concerned with implementing the training sessions assigned annually by the Education Ministry.

vi. Formation of links with organizations outside the school system.

In addition to creating links with the university world, the Enlaces Program has been able to cultivate successful cooperational links with the private sector.

Telefónica CTC and the Education Ministry signed an agreement in 1996 in which the telecoms company committed itself to donating telephone lines and Internet connections to all primary and secondary schools in Chile for a period of 10 years. The company also promised to carry out a large number of training sessions for teachers, and to develop educational content for the World Wide Web. This link has provided a very strong boost for introducing ICTs into schools, which have become one of the most valued resources in the educational system today. In a second agreement signed in 2000, *Telefónica CTC* agreed to provide 26 educational establishments in the country with high-speed 128-kbit dedicated lines for a network of 20 computers in each school.

Telefónica has established a close relationship with the educational system that undoubtedly will bring benefits not only in terms of its image, but also in terms of future demands for its services from schools that may wish to renew their Internet connections when the donation period comes to an end. It is also possible that the introduction of Internet in schools will lead to Internet connections in students’ homes.

Furthermore, the Education Ministry recently launched the educational web site educarchile.cl,[41] which it jointly developed with the *Fundación Chile*, a private non-profit institution dedicated to technology transfer in different areas of production. This portal, which is a platform of communications and educational resources that is unique in the country, will undoubtedly become an important reference point for teachers, pupils, researchers and parents alike. At the end of 2002, only slightly more than a year after its launching in October 2001, it had already got 18,961 users, 12,177 of which were teachers, 4,942 were students, 1,041 families and 801 were researchers. The amount of resources that have been collected in connection with educarchile.cl, (donations, etc.) and the amount of material and human resources that have been needed for the portal to function properly have led authorities to conclude that working with a flexible and specialized private organization such as *Fundación Chile* has been a very good option for the development of this Portal.

vii. Importance of appointing a Coordinator for the educational informatics laboratory.

Lastly, one of the most positive measures taken by Enlaces has been to require the establishments that join Enlaces to provide a teacher-coordinator who works at least 15 hours per week for the Enlaces laboratory. The coordinators carry out administrative (organization of the use of the laboratory, for example), teaching (orientation in the use of certain technological resources) and technical (solution of problems such as deconfiguration of equipment, etc.) duties. The presence of the coordinator is important to ensure proper use of the resources in the Enlace laboratory, which are used for many hours a day. This coordinator receives special training from the Zone Centers and Executive Units.

(d) Impact, achievements and results

The success of the Enlaces Program has been evaluated in reference to three areas, namely processes, program objectives and impact.

The first type of evaluation observes the various processes planned in the Program, such as, training and consultancy for installing and using

[41] "Educarchile provides teachers with access to more than 500 lesson plans in various courses, 3000 existing educational web sites, educational sites developed specially to support the new curriculum, hundreds of articles on educational topics, orientation files on educational software, and media resource centres..." (www.educarchile.cl).

the computers and the effective use that the actors of the school community make of the resources. One of the most visible findings of the evaluations is the current low level of ICT use in teaching. Enlaces has not managed to ensure that the resources are used in a pedagogical manner that is closely related to the curriculum. In fact, it seems that the technology and training input provided to date has not been sufficient or has not been correctly used in order to encourage more pedagogic use of ICTs by teachers. There is therefore also a low level of laboratory use (see Box).

FREQUENCY OF COMPUTER USE —DIRECTORS OF SCHOOLS

	Weekly	**Daily**
Primary Education	25.7%	44.1%
Secondary Education	23.8%	35%

Source: Enlaces Programme, «Survey on provision and use of information and communication technologies», March 2001.

According to a study sponsored by the Enlaces Program entitled "Survey of the provision and use of information and communication technologies, 2001", the laboratory coordinators devote on average 15 hours to the laboratory (out of a possible total of 44). Most of that time (54.1% in primary and 50.17% in secondary schools) is spent on support work for users of the laboratory (students and teachers). Time is also spent on other activities, although to a lesser extent, which include planning activities jointly with other teachers (6.14% in primary and 5.64% in secondary) and planning with other teachers, activities that integrate ICTs into the various areas of the curriculum (7.43% in primary and 7.16% in secondary). This shows that the level of teaching use is still low, and that most uses are concerned with basic aspects of the use of the technologies.

According to data collected by the Enlaces Program, a typical student's laboratory use is one hour, once a week, in groups of three or four per computer. The teaching experiences vary from learning about the software, to searching for information on the Internet, to the holding of classes aimed at specific curriculum— related learning objectives.

The evaluations on the compliance with the program's objectives are concerned with the degree of progress teachers have made in achieving the program's objectives, aims and initial deadlines (for example, in relation to the fulfilment of the goals set for coverage, budgets, etc.).

ORIGIN OF EXISTING EQUIPMENT IN SCHOOLS.

Origin of equipment	**Primary**	**Secondary**
Provided by Enlaces	80.8%	58.6%
Other projects of the Ministry of Education	5.9%	5.7%
Purchased by sponsors	5.2%	18.8%
Purchased by the parents association	3.7%	7.9%
Fund-raising activities	0.5%	1.3%
Other	3.8%	7.7%

Source: Enlaces Programme, «Survey on provision and use of information and communication technologies», March 2001.

When the program was launched at a national-level, Enlaces set itself the goal of reaching 50% of primary schools and 100% of secondary schools by 2000. As can be seen in the table below on Enlaces coverage, this goal was successfully accomplished (the remaining percentage of secondary schools are those which have voluntarily left the Program).

As can be seen in the following table, Enlaces has been the main provider of computer resources to schools, accounting for 80.8% of total existing equipment in primary and 58.6% in secondary education. Providing computer use at secondary education level is more important as children are preparing to enter the job market. This is evident from the figures which show 18.8% of computers in secondary education level have been purchased by sponsors.

Some agencies have concluded that the program has been successful based on the fact it has managed to achieve national coverage without sacrificing quality and equity. Evaluations have also attributed the program's success to the following factors: focus on the teachers, the building up of a social network of educators and the educated, decentralized government support and respect for the autonomy and decisions of schools in their use of the technologies. They also emphasize elements such as the quality of the project's technical and management team saying they are flexible, creative, visionary, etc.

Specifically regarding evaluations of the **impact** of the Enlaces Program, two longitudinal surveys were carried out between 1993 and 1998, based on interviews with pupils, teachers and parents.

On the whole, the results of these evaluations indicated that the

Enlaces Program helps to increase the level of creativity of the pupils as well as their cognitive ability and their reading comprehension. The greatest advances were observed in creativity, which indicates that the Enlaces model makes its students more fluid, flexible and particularly original thinkers, and these benefits increase the longer the subjects remain with the Program.

In relation to reading comprehension, at the end of one year with Enlaces, the pupils in 33% of the courses evaluated had significantly improved their understanding of what they read. In the second year this figure increased, rising to 58% of courses where the pupils had significantly improved their reading comprehension.

At the teaching level, significant improvements were noted in the organizational climate of the schools. The teachers said that they thought their classes had improved with the use of ICTs and believed ICTs offered important opportunities for professional development. They also saw an improvement in equality of opportunities for themselves and their pupils as they were able to use technologies which the majority of them would otherwise have difficulties in accessing.

The parents also had an improved perception of the establishment and its performance. This made them more supportive of the schools in general and the teaching-learning process of their children.

At the organizational level of the Schools, more horizontal relationships arose between the different sectors (teachers, management and pupils) with the introduction of ICTs, while the community's perception of the level of organization in schools improved. This can be seen in the increase in enrolment at these schools. The negative impacts included increases in operating costs (electricity, ink, paper, etc.).

3. A turning point and future challenges

The most important and critical challenge facing e-learning is the current low level of pedagogic use of ICTs in schools. Enlaces now finds itself at a turning point, where it needs to shift its focus from the stage of training staff how to use the system to encouraging teachers to actually use the technology. This new focus will require confronting and resolving a series of obstacles that arise and that impede the institutionalization of educational computer technology and the effective teaching uses of ICTs. These obstacles are related, on the one hand to the existing situations in the schools, and on the other hand, to strategic shortcomings of the Program. Some of the most critical points which impede the pedagogical uses of ICTs in schools, are mentioned below.

- The action of the Enlaces Program has been carried out in a relatively similar way in all schools, failing to take into account local contexts, learning sectors and the specific needs of certain teachers. For example, the teacher training has not managed to develop an effective "teaching empathy", that deals with a range of learning sectors so that different teachers can adapt the skills to their particular classroom needs.

- Problems of obsolete equipment and maintenance. The obsolescence of some of the equipment (especially equipment provided prior to 1996), plus the excessively cautious attitudes of some teachers and directors to using ICTs, has prevented greater daily use of the ICTs.

- The insufficient number of computers and peripheral equipment (printers, scanners, projectors, etc.) to support teaching. For many teachers it is very difficult to face a group of 40 to 45 students with only three to nine computers between them. More computers are needed, and suitable methodologies should be provided to help teachers to make maximum use of the scarce resources.

- Insufficient number and low relevance of educational software to support the different areas of learning included in the curriculum (mathematics, understanding of the environment, language, etc.).

- The teachers see ICTs more as a time-consuming rather than a time-saving activity, which requires an assimilation stage.

- The teachers' timetable duties prevent them from having more time to practice and even less time for planning classes using technology that they have not entirely mastered themselves, and in which any time invested is not compensated for.

- Lack of commitment of the school management teams to use ICTs in education. This lack of commitment is seen in a lack of the resources needed for the basic functioning of the laboratory (operating costs, but also remuneration of the laboratory coordinator). It is also seen in the low or non-existent level of connection between the use of those resources and the school's institutional plan.

As previously mentioned, these are some of the factors that the Enlaces Program has to deal with if it wishes to ensure the effective use of ICTs in Chilean schools. This is no less difficult, if it is considered that many of the variables mentioned above are beyond the sphere of influence of Enlaces, which is only one of the Education Ministry's many programs.

It also no less difficult if considered in a context of educational decentralization., In such a scenario it is difficult to force upon establishments regulations to carry out actions such as assigning a certain number of teaching hours to coordination tasks for the Enlaces laboratory, or even to include educational computer technology as a principal tool for implementing the institutional plan of each school.

F. E-Media[42]

"E-Media" is closely related to "e-Culture". In literature this industry is often referred to as the "cultural industry". Multimedia has been a very dynamic sector over the recent decade. This is basically the result of the advancing process of ICT-convergence, the ongoing digitization of media content and the creation of large and powerful multinational companies in the sector. The industry itself is very complex, and has emerged from a number of antecedent industries, including the IT industry, the film and video industry, the broadcasting industry, cable TV, the publishing industry, radio broadcasting and the software industry. It is one of the five biggest industries in the world economy and certainly the most powerful one. The multimedia industry can not be compared quantitatively with other industries, given its great social and political importance.

1. Worldwide and regional dynamics

Latin American multimedia is considered one of the most structured in the world (Rosa, 1998) and is certainly outstanding in its performance in comparison to the rest of the developing world (Hopenhayn and Ottone, 1997). Spanish and Portuguese content markets capture more than 600 million people worldwide, including more than 50 million people in Europe and a 32 million Hispanic audience in the United States. With 83% of South American households and 77% of the Central American households equipped with a television set in 2000, the broadcasting industry reaches a large audience in the region. With a literacy rate of about 90% (up from around 70% before 1990),[43] the written media (newspapers, magazines, etc) is also very influential in Latin America and the Caribbean. Latin America is also the world's fastest growing Internet community (ITU, 2000a), reaching an Internet penetration of more than 8% in 2002 (up from less than 1.0% in 1998).

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[42] The author would like to thank Mr. Antonio Rosa (President of the Brazilian Associação de Mídia Interativa) for his inspiring input.

[43] Illiteracy rate per country in 2000, aged 15 years and over: Argentina 3.1%; Bolivia 14.4%; Brazil 14.7%; Chile 4.3%; Colombia 8.2%; Cuba 3.6%; Ecuador 8.1%; Mexico 9.0%; Peru 10.1%; Uruguay 2.2%; Venezuela 7.0% (ECLAC, 2000)

Grupo Cisneros, Grupo Abril, O Globo, Grupo Clarin and Televisa are some of the powerful local companies that run magazines and newspapers, radio stations, television broadcasting and WebPages, and provide content in sports, entertainment, news, music and movies. In Brazil for example, large content generating companies like Rede Globo, SBT (Sistema Brasileiro de Televisao), Rede Bandeirantes de Televisão, Rede TV and Rede CNT produce programs for 296 broadcasting stations, with the help of 138 affiliated groups, which control 668 communication channels, like TV networks, newspapers and radio networks (Rosa 2001).

However, these regional content providers are relatively small in comparison to their multinational counterparts. AOL-Time Warner (United States), Walt Disney (United States), Viacom (United States), News Corp (Australia), Sony (Japan), Vivendi Universal (France) or Bertelsmann (Germany) are powerful multimedia conglomerates, which have been created through a phase of intensified mergers and acquisitions over recent years. In general, revenues of the above mentioned Latin American media companies are about 6%–12% of those of international media giants. Lured by the large Spanish and Portuguese speaking audience in the South of the American hemisphere, the powerful multinational companies started to enter the Latin American content market, forming alliances or competing with local content providers. A direct consequence has been an increasing globalization of information flows in the region. While in the past the dominating global trademarks which came into the region carried names like Coca-Cola, Ford, VW, Philips, McDonald's or Kodak, nowadays an increasing number of intangible "content-goods" are being imported. These goods are provided by companies such as CNN, Fox, Discovery, Sony, MTV, AXN, HBO, TNT, Cartoon Network, Nickelodeon, Bloomberg, ESPN, etc.

However, in practically all the countries of Latin America and the Caribbean laws exist, which impede the unrestricted entry of foreign capital into the local media industry. This kind of legal protection might be a relict of the time of import-substitution; nonetheless the political and social importance of the media industry has secured their existence until the present day. In March 2002, the Brazilian Câmara dos Deputados approved an advanced liberalization of capital of media companies, as a result of massive national and international pressure. As the Senate also passed the law in May 2002 it allows international investors to obtain up to 30% of the companies in the sector. At least 70% of the capital of "journalistic and sounds and images resonant broadcasting companies" still need to remain in the hands of "native or Brazilians naturalized more than 10 years ago, who obligatorily exercise the management and set up the content of the programming" (Emenda Constitucional, 2001).

Critics of the liberalization of the Latin-American media industry

TRADING CONTENT THROUGHOUT THE WORLD

Latin America and the Caribbean is very rich in culture. The cheerful and emotional way of life and the local indigenous background provides many opportunities to create valuable content. Brazilian, Mexican and Venezuelan soap operas (so-called "Telenovelas") have been a very successful business model for the regional broadcasting industry and have raised hopes for the establishment of a flourishing and competitive industry. Latin America has a large potential target market for its content. The common Christian and western-world roots make the lucrative European and North American markets potential export destinations. Already today almost 20% of the Latin-American media content sales in the hemisphere are consumed by Hispano-Americans in the United States (FAPAE, 2000). It is often harder for the Asian content export industry, for example, to enter these markets, due to the different cultural background.

However, thoughts about an exporting content industry need to consider that it seems the leadership of the United States in multimedia content creation will continue unrivalled for the time being. Europe for example (which has a very deeply rooted and pluralistic culture) has tried for several decades now to rival with the United States' content machinery, without significant success. In 1995 for example, the exchanges of audiovisual programs (cinema, video and television) between the European Union and North America came to a negative balance of US$ 6.273 million (Europe sold US$ 532 million and purchased US$ 6,805 million from North America) (EAO, 1997).

Source: Martin R. Hilbert

claim that through the internationalization of this politically important and culturally influential sector, the rich and valuable cultural heritage and the independence of Latin America and the Caribbean would become further endangered. This would additionally allow the powerful multinational companies to take over and would destroy the chance of creating an international competitive media industry to export regional media content.

Supporters of liberalization of the Latin American content industry claim that it is irrational to cling to an import substitution ideology in a sector, where the technological reality has already rendered such policies obsolete. In contrary to markets where products can be physically "locked up", liberalization supporters claim, that media content is already flowing globally through the international information infrastructure. The vast majority of the "regional" TV-for-subscription or Internet content for example, is practically already imported (Rosa, 2001).

It is claimed that first of all, the regional content industry is not competitive and secondly, on its own it would simply not be capable of satisfying the great demand for multimedia content which is consumed every second by the large and demanding Latin American and Caribbean audience. In the media industry, cultural aspects always define an audience, and therefore fears of an "cultural invasion" would seem to be exaggerated. Jokes, slang, historical and political references to local events and personalities are an essential part of the information and entertainment business. Audience ratings for United States sitcoms in Latin America for example, were way below the initial expectations of the United States content provider in the region. Supporters of this theory often use a "soccer analogy" (MSDW, 2000). Soccer is popular all over the world, but people are interested in local soccer results. Similarly, they will always be interested in local content. The existence of a "global information infrastructure" does not render the "soccer analogy" obsolete. A small group of people might start to get interested in oversees soccer results, but this will continue to be the exception. Therefore, local content will never be completely "substituted".

Continuing with the soccer example, the actual issue of concern in the liberalization debate is not so much that Latin American media consumers will suddenly start to watch foreign soccer teams, but rather that foreign investors will buy the regional teams, and then broadcast and commercialize them. By making use of economies of scope worldwide, multinational companies provide customized local content, based on a combination of local and worldwide input.[44] The key question therefore is not so much if local content providers will continue to provide local content, but rather if they will be able to remain financially independent. The second question would then be what the long-term relationship between financial control and control over content is.

Similar to what happened with other industries in Latin America before, many observers of the regional media industry expect the take-over of multinational companies. For Latin American economies this means fresh investments, foreign capital and know-how spillover due to better integration into worldwide networks. However, for many, the importance of regional media independence weighs more heavily than economic aspects.

The first step to face these emerging dynamics in the regional media sector is to understand the new context in which this industry finds itself before coming back to the actual process of concentration in the worldwide media industry and what this signifies for Latin America.

2. The new e-Media context

The far-reaching and complex innovations in ICTs over the recent decade are quickly entering the traditional media sector. The irreversible

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[44] For example CNN, CNN en español, CNN Brasil, etc. Also "AOL Anywhere", "AOL Latin America", "AOL Argentina", "AOL Brasil", "AOL Mexico", etc.

convergence of telecommunications and the electronic and computers sector with the media not only has impacts on the constellation of the industry, but is also revolutionizing the nature of content and entertainment itself, and therefore affecting cultural behavior and habits (Rosa, 2001).

The first part of this convergence process in media is the digitalization of media content. The second one is the use of two-way Information and Communication Technologies. Both of these factors enable (1) worldwide diffusion to and through a vast number of access technologies, (2) easy reproduction, (3) interactivity and (4) individualization and customization of content. These four pillars are the basis for the new e-media context:

1) A key characteristic for the multimedia content industry is that its final product is a non-physical and non-rival good. Its digitalization is favoring worldwide diffusion at a very low cost through the global ICT infrastructure. It is also enabling "multi-casting", which is the transmission of multiple signals through the same channel. In this way, different media systems (TV, Internet, radio, digital newspapers and journals, etc) can be consumed through the same access device (whether this device is mobile or fixed, individual or collective). The convergence process in the Infrastructure Layer is constantly bringing new end-user equipment to the market. Cell-phones, PDAs, television sets, set-top-boxes, game-consoles, DVD or CD Players, Internet radio and personal video recorders are already being employed for media consumption. Technological advances and ever-increasing bandwidth introduce new software tools in the Generic Service Layer as well. For example, streaming-media service tools like RealPlayer, Windows Media Player or Quick Time, more than 5000 audio-visual broadcasters and 20,000 radio stations worldwide can already be reached through the Internet (Rosa, 2001). Standard issues need to be considered in this context (see section "Telecommunications regulations"). Proprietary standards in hardware and software can discriminate against content availability and also "lock-in" customers into closed networks, while open standards favor free market mechanisms for service and content consumption.

2) Digitalization also enables the exploitation of almost infinite reproduction and the resulting economies of scale. Content production is almost 100% fixed costs. The cost of reproduction is almost zero. As a consequence, an increasing process of concentration can be observed in the content producing sector. The easiness of reproduction of digital media content can also be observed at the many Peer-to-Peer portals, which were created between 1999 and 2001. File-sharing systems[45] enable Internet users

[45] Like KaZaA or Napster (which is currently a commerzialized part of the German Multimedia company Bertelsmann).

to exchange digital music files, images and even entire movies worldwide on a massive scale.

3) The up-grade of a one-way broadcasting infrastructure to a two-way communication network is introducing the powerful "interactivity" to the media business. Interactivity is the driving force of the emerging t-commerce (television commerce). Similar to the Internet of today, Digital Television (see Section about infrastructure) enables online transactions. Instead of "clicking on a banner" or motionless image on a WebPage, the TV remote control could be used to "click" on a TV spot or a movie scene, to reach more information about the products and services presented and to eventually buy them (Rosa, 2001).

4) Data centers and intelligent information systems help to exploit economies of scope in order to individualize and customize content at a relatively low cost. Individualized news services and customized entertainment shows increase in the value of media performance. Similar to Business Intelligence that is already in use in the e-commerce sector, applications like Customer Relationship Management (CRM) are deployed for media services. With the help of vast databases large companies make use of scale in order to find out about preferences and demand patterns of individual customers. Afterwards, sophisticated information systems enable the customization of the information. The use of these kinds of intelligent systems permits large companies to combine low prices (through economies of scope), with tailor-made attention to every single customer, which could threaten the survival of many small companies.

RADIO AND TV GETTING DIGITIZED AND MERGED INTO THE GLOBAL INTERNET INFRASTRUCTURE

One of the most dynamic fields in this process of convergence between technology and media, is actually one of the most traditional information technologies. Advances in streaming audio channels through the Internet have already moved 20,000 radio stations to the 'network of networks' and about another 25,000 are expected to follow suit (Rosa, 2001). WebRadio means that traditional local AM or FM frequency bands get replaced by the worldwide digital Internet infrastructure. Using IP, satellite networks can also be used for radio transmission at a relatively low cost.

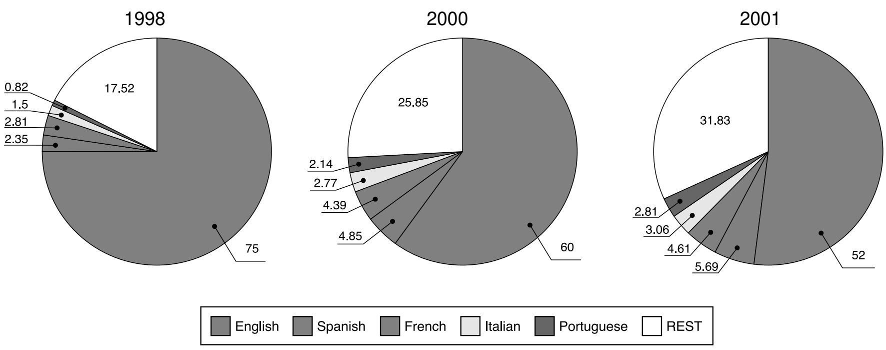
Besides pure audio channels, advances in audio-visual media will surely affect the life-style of media content consumers all over the world during the next decade (Rosa, 2001). A recent study conducted by the British Strategy Analytics in 40 countries worldwide concluded that the number of interactive TV users could reach 625 million in 2005. This would be similar to the explosive growth of the Internet between 1997 and 2001. Also in Latin America and the Caribbean these dynamics are becoming evident, as the first interactive television services are launched in several countries of the region.

Source: Martin R. Hilbert

The traditional media companies in Latin America and the Caribbean have already started to invade the Internet. Basically all newspaper providers in the region have a Web presence. The larger media content groups also created new portals in order to make full use of the new distribution channels. Fohla Group and Grupo Abril in Brazil for example, created UOL, Latin America's leading online portal and Internet service provider. Grupo Cisneros from Venezuela heavily invested into AOL Latin America and holds an equal share with AOL itself (both have 40%). Televisa from Mexico launched EsMas.com and Argentina's Grupo Clarín established Prima S.A. *(Primera Red Interactiva de Medios Argentinos)* Local media companies are leaving the stage of using only few distribution channels and are becoming true multimedia companies.

Internet development in the region is incipient, but explosive. The increasing presence of Latin America and the Caribbean in cyberspace can be shown through the development of the number of WebPages in Spanish and Portuguese. While in 1998, only 3.17% of the worldwide WebPages were in Spanish or Portuguese, in 2001 content in these languages soared to 8.5% (9.4% of the world population are native Spanish and Portuguese speaking).

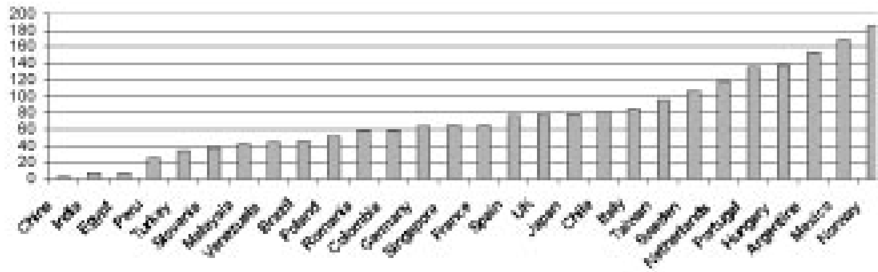
WORLDWIDE WEBPAGE DISTRIBUTION BY LANGUAGE



Source: FUNREDES (Fundación Redes y Desarrollo), «Presentación de los lenguajes y culturas latinas en la Internet», Daniel Pimienta, (http://funredes.org), 2001.

Comparing the number of WebPages registered at national domains with the number of Internet users in a cross section of countries, it can be observed that especially Mexico and Argentina reach above average results in WebPages creation.

WEBPAGES REGISTERED AT NATIONAL DOMAINS PER INTERNET USERS FROM THE RESPECTIVE COUNTRY (WEBPAGES/ USER IN 2001)



Note: The graph excludes the United States, given that general domain names that are registered in the United States (.com; .net, .org, etc.) distort the picture.

Source: Martin Hilbert, based on ISC (Internet Software Construccion) and Netsize, 2001. http://isc.org

3. Media concentration

The terms "media concentration" and "the power of the media" crop up almost daily in broadcasting and the press. Generally speaking, concentration of ownership occurs most frequently in industries that benefit from economies of scale and scope and where entry barriers are high. These characteristics are especially true for information and entertainment production and processing. A process of market concentration in the media has become a long established phenomenon. The number of daily newspapers in the United States, for example, declined from a high of 2,202 in 1910 to 1,483 in 2000, while during the same period, the number of ownership entities declined from 2,153 to only 436 (Demers, 2001).

It is interesting to observe that the advent of additional distribution channels through modern ICTs introduced a temporary wave of de-concentration to media markets around the world. For example, the mature United States television market of the 1980s (in 1976 the largest three networks ABC, CBS and NBC captured 92% of United States viewers) has become less concentrated nowadays, given the advent of cable and satellite systems (in 1996 the share of the three traditional networks dropped to 53%) (Noam, 1999). The emergence of hundreds of Internet magazines and newspapers during the second half of the 1990s seemed to underline this trend. However, this temporary process of de-concentration seems to reverse as new technologies mature. Economies of scale take over and economies of scope help to exploit fixed costs. In conclusion, ownership seems to be tending towards concentration once again. The total number of companies controlling 50% of United States user minutes online shrank from 11 to four, between March 1999 and March 2001. Even more drastic was the drop in the number of companies controlling 60% of all United

States minutes spent online, from 110 in March 1999 to 14 in March 2001 (Jupiter Media Metrix, 2001). The number one in the United States Internet market is the media giant AOL-TimeWarner, which accounted for 32% of online time. The former myth that severe market dominance is impossible on the Internet because the number of potential online channels is infinite, was disproved by the powers of economies of scale and scope (see Introduction to Chapter "Vertical Sectors") and led to the reality of an irrefutable trend toward online media consolidation.

Similarly to the Internet, radio and television industries also seem to undergo ownership concentration again, after the new transmission technologies have matured. The number of radio stations in the United States increased from 10,403 to 10,795 between 1996 and 2000, while the number of station owners decreased from 4,865 to 3,832. Similar to radio, fewer than 370 companies owned one or more of the 1,348 commercial television stations in the United States in 2000 (BIA Financial, 2000) (Dalmas et. al, 2001).

The tremendous cost of advanced content production is accelerating the trend and is raising the entry barriers even for the largest companies. Five of the most important studios in Hollywood for example (MGM, Warner Bros (AOL-Time Warner), Universal Studios (Vivendi Universal), Paramount Pictures (Viacom), Sony Digital Entertainment (Sony) recently joined forces in order to set up a new company specialized in displaying movies over the Internet. Also Walt Disney (Walt Disney Pictures and Touchstone) and News Corp. (Twentieth Century Fox) got together in order to be able to compete in the costly online movies market.

In a general economic context these are natural and explainable dynamics, which are usually regulated and controlled by antitrust and anti-monopoly legislation. However, market concentration in the media industry is more than economics. Monopoly power in most other industries usually implies little competition and high product prices. The implications for democratic values however, are almost zero. On the other hand, a monopoly in the publishing industry for example, would have implications that go way beyond the wholesale price of books.

The recent AOL–Time Warner merger has raised major concerns about media concentration and its impact on diversity. After the merger of Time and Warner in 1989 and the acquisition of Turner Broadcasting Systems in 1997, the greatest deal in history merged Time-Warner and AOL in 2001, with an estimated market value of US$ 350 billion. It created the world's largest media company and an extraordinarily powerful multimedia giant. Its total revenues topped US$ 38 billion in 2001, which is more than the GDP of Bolivia, Ecuador, Paraguay and Costa Rica together.

The vertical control of these kinds of conglomerates is impressive. Companies belonging to AOL-Time Warner, Warner Bros. Pictures can make a film, advertise it in magazines like Time, Life, People or Fortune and TV channels like CNN, and show it in Warner Cinemas. The soundtrack can be released on Ruffnation Records or Warner Bros. Records and be promoted through the Elektra Entertainment Group. Also Internet portals like America Online or Compuserve, as well as special chat groups in ICQ can help to promote the movie. Later the video is released on Warner Home Video and is shown to paying cable viewers on HBO, then to all viewers on WB.

The worldwide trend of media concentration is driven by the United States economy, where a major reason for the lack of regulation is the first Amendment of the United States Constitution which ensures that the "Congress shall make no law… abridging the freedom… of the press". This has led to the creation of three dominating North American media giants: AOL-Time Warner, Viacom and Walt Disney. However, the European media giants Bertelsmann and Vivendi Universal, as well as the Australian News Corp and the Japanese Sony are also looking for strategic partners and alliances worldwide, in order not to get overrun by the dynamic process of media convergence. The following table shows the seven largest media groups, with a sample of companies, which they control.

WORLD'S SEVEN LARGEST MEDIA GROUPS WITH SELECTED COMPANIES PER MEDIA SECTOR

	Internet	TV	Film	Music	Publishing	Radio	Other
AOL-Time Warner *(U.S.)*	AOL, Netscape, Compuserve, Spinner, Mapquest, etc.	Warner Brothers TV, HBO, Cinemax, CNN, TBS, TNT, Cartoon Network, Looney Toons, etc.	Warner Bros Studios, Castle Rock Entertainment, New Line Cinema, etc.	Atlantic Group, Rhino Records, Elektra Entertainment, Time Life Music, etc.	Time Life Books, Little Brown and Co Time Magazine, Life Magazine, Fortune, People, Money, Popular Science, etc.		Atlanta Braves, Atlanta Hawks, Goodwill Games, Wrestling, etc.
Viacom *(U.S.)*	MTVi, CBS Internet Group, Nickelodeon Online, etc.	Paramount, CBS, UPN, MTV, Nickelodeon, TNN, VH1, The Movie Channel, etc.	Paramount Picture, Blockbuster Video, Nickelodeon Movies, United Cinemas, etc.	MTV, Famous Music, etc.	The Free Press, Touchstone, Pocket Books, MTV Books, etc.	Infinity broadcasting (180 stations)	Theme Parks, Star Trek Franchise, etc.
Bertelsmann *(Germany)*	Napster, CDNow, Barnes& Noble.com, Sport1, etc.	UFA, RTL, Channel 5 UK, Fun TV, Multivision, etc.	UFA, Cinevideo, First Choice, etc.	BMG, Bad Boy Records, RCA, etc.	Gruner & Jahr, Springer Verlag, Capital, TV Today, Brigitte, Child, Fitness, etc.	RTL Radio, etc.	Sonopress
Walt Disney *(U.S.)*	ABC.com, Family.com, ESPN Internet Group, NFL.com, NBA.com, etc.	ABC, Touchstone Television, Disney Channel, Soapnet, ESPN, Animation, etc.	Walt Disney Pictures, Touchstone Pictures, Hollywood Pictures, Buena Vista Home Entertainment, etc.	Buena Vista Music Group, Lyric Street Records, Mammoth Records, etc.	Discover, Walt Disney Books, Hyperion, Miramax, Oakland Press,	ABC, Radio Networks, ESPN Radio, etc.	Disney Theme Parks, Disney Retail, Mighty Ducks, etc.
Vivendi Universal *(France)*	Vivendi Net, Universal Studios, Vizzavi, MP3.com, etc.	Universal TV Group, Universal Pictures, Canal+, etc.	Universal Studios, October Films, Multimedia Entertainment, etc.	Polygram, Motown, MCA, Decca Records, Universal Records, etc.	Havas Press		Vivendi Telecom International, Cegetel, Vivendi Environment (water distribution), Spencer gifts, Viventures, etc.
News Corp *(Australia)*	Healtheon, News Digital Systems, etc.	FOX Broadcasting, FOX Newschannel, FOX Kids, British Sky, Star TV, etc.	Twentieth Century Fox, New Sky Studio,		HarperCollins, NY Post, Regan Book, The Sun, The Herald Sun, The Daily Telegraph, Weekly Standard, etc.	Sky Radio, Radio 538, etc.	LA Dodgers, Madison Square Garden, NY Knicks, NY Rangers, etc.
Sony *(Japan)*	Sony online, Jeopardy, Tri-Star online, The Station, etc.	Columbia Tri-Star, Sony Pictures, Sony Entertainment, E! Latin America, Telemundo Group, etc.	Sony Pictures Entertainment, Tri-Star Pictures, Columbia Pictures, Columbia Tri-Star Home Video, etc.	Columbia Records, Epic Records, Sony Music, Rubenstein, Sony Broadway, etc.			Sony Electronics, Sony Computer, PlayStation, DVD, Sony Life Insurance, etc.

Note: Listing does not necessarily imply a 100 percent ownership.

Source: Public Broadcasting Service, America's public TV stations, http://www.pbs.org.

The Internet business is becoming increasingly important for these kinds of conglomerates. Morgan Stanley Dean Witter estimates that in 2001, 25% of the revenue of AOL-Time Warner came from the Internet business, just topped by the TV business (33%) and already passing the film segment as a revenue source (20%).

Similar to the rest of the world media concentration in Latin America can also be observed. Televisa, Mexico's largest media group, runs 189 of the 200 most popular TV programs in the country. It captures 76% of the national

TV audience (Grupo Televisa, 2000). The Brazilian Rede Globo, with its 133 broadcast and affiliate stations, reaches 74% of the Brazilian TV audience during prime time (Rede Globo, 2002). Grupo Abril, Brazil's largest publisher, controls 233 magazines and sells 224 million copies yearly. It edits seven out of the 10 most popular magazines in the country (Grupo Abril, 2002). The maturing trend of concentration in the Latin American media industry is advancing, as the recent merger of the Brazilian newspaper providers Grupo Folha and Grupo Estado demonstrates (Rosa, 2001). In the Internet market, the two largest Brazilian portals (UOL and BOL, both connected to Grupo Abril) capture 30% of page views among the ten largest Brazilian Internet portals (Hilbert, 2001a). The following graph shows five large Latin American media groups and the media channels they use.

LARGE LATIN AMERICAN MEDIA GROUPS WITH SELECTED COMPANIES PER MEDIA SECTOR

	Internet	**TV**	**Film**	**Music**	**Publishing**	**Radio**	**Others**
Grupo Televisa *(Mexico)*	EsMas.com, etc.	Televisa (300 stations), Cablevision, Innova,	Televisa	Melody y Fonovisa	Edivisa, TV y Novelas, Tele-Guia, Muy interesante, etc.	Acir-Radiopolis, XEW-AM, XEQ-FM, etc.	Skytel, Servicios Doblaje, etc.
Globo *(Brazil)*	Globo online, Shoptime, Som Livre, etc.	Canal Brasil, Globo News, Telecine, Premiere, Rede Globo, USA network, Sportv etc.	TV Globo		Diario de São Paulo, Casa & Jardim, Galileu, etc.	98 FM, Globo FM, Radioclick, etc.	Segurada Roma, Globopar, Telecurso, Praia Shopping etc.
Grupo Clarin *(Argentina)*	Prima, Clarin.com, etc.	Channel 13 BA, Multicanal, Trisa, Metropolis Intercom, etc.	Patagonic		Calin, Olé, Artes Graphicas, Elle, Cimeco, DyN, etc.		Hotel Clarin, etc.
Grupo Cisneros *(Venezuela)*	AOL Latin America, El Sitio, etc.	Univision, Caracol Television, Venevision, Chilevision, etc.		HTV, Telehit, Much Music Latin America		Ibero-american Radio Chile, etc.	IAMP, Panamco, Miss Venezuela, etc.
Grupo Abril *(Brazil)*	UOL, BOL, Usina do Som, etc.	MTV Brasil, ATV, etc.		Abril Music, Usina do Som	Editoria Abril (150 titles), Veja, Nova, Claudia, Editoria Caras, Almanaque Abril, Guia do estudante, etc.		Guias quatro rodas, Fundacao Vitor Civita, etc.

Note: Listing does not necessarily imply a 100 percent ownership.

Source: Grupo Televisa, *Annual Report, 2000*, México, D.F., Rede Globo, «A Empresa» (http://redeglobo1.globo.com/home), 2002; Grupo Clarin, official website (http://www.grupoclarin.com.ar/), 2002; Grupo Cisneros, «Cisneros Group of Companies» (http://www.cisneros.com/about/aboutUs.asp), 2002; Grupo Abril, official website (http://www.abril.com.br), 2002.

Comparing these Latin American media companies with their multinational counterparts, it becomes clear that the regional media groups are of significantly smaller magnitude. Total revenues of the regionally powerful Grupo Televisa, are comparable with 8.6% of the total annual sales of Walt Disney (US$ 2.15 billion vs. US$ 24.88 billion in 2001) (Walt Disney, Grupo Televisa, 2002). Grupo Cisneros reached total revenues of US$ 4 billion in 2001, while their North American alliance AOL-Time Warner collected US$ 38 billion (Grupo Cisneros, 2002). Grupo Clarin accounted for a turnover of US$ 2.2 billion in 2001 (Grupo Clarin, 2002), while their German counterpart Bertelsmann reached more than 10 times as much (Bertelsmann, 2002).

This scenario is reminiscent of what happened to other industries in Latin America and the Caribbean before. Incapable of harnessing the financial capital required for the rapid expansion and early internationalization, local firms ended up being taken over by worldwide giants. In the automotive industry for example (just to mention one example out of many), the scale of multinational conglomerates was too powerful for the Latin American automotive industry.

In order to get a hold of the media-fanatic Latin American market, powerful multinational media companies have already started entering the region. Sometimes they compete with domestic information and entertainment providers. Sometimes they form alliances with them. The strong linkage between Cisneros and AOL established in 1999, is a vivid example for the second alternative. However, unlike what happened in the automotive industry, this time, Latin American media companies are also reaching out to markets in the United States and Europe in search of a piece of the Hispano-American pie in the United States or the Spanish and Portuguese audience in Europe. These efforts are incipient and evidence for this is rather anecdotal, but surely deserves attention and support.

4. The odds for the cultural industry in Latin America and the Caribbean

The globalization of multimedia content providers and advances in transmission technologies is causing market concentration in the media sector. Technological advances suggest a natural concentration in the content industry. The non-rivalry of digits permits infinite economies of scale in content production. The digitalization of media content and the usage of the global Information and Communication infrastructure to transmit it, is breaking down every form of informal industrial protection, which until now has sheltered the local media industry in Latin America and the Caribbean. The "death of distance" (Cairncross, 1997) enables superior content providers from the developed world to reach individual doorsteps inside developing countries through digital infrastructure. This direct and worldwide competition for digital goods and services can have devastating consequences on local industries. However, it can also open up new export markets.

The information and entertainment industry provides a key business model in an Information Society. Latin America and the Caribbean are very rich in culture. The cheerful and emotional way of life provides many opportunities to create valuable content while statistical evidence shows that Latin America and the Caribbean are increasingly using digital infrastructure to spread their "cultural goods". However, the production of content will need to be seen more seriously in Latin America and the Caribbean. It is necessary to "industrialize" the production and eventual export of information and entertainment goods through digital networks. Scale is necessary to establish an internationally competitive industry.

It is claimed that the demand for local content will naturally protect Latin American content providers. Until now, this theory has proved to be correct (in Brazil for example UOL tops Yahoo, Globo News tops CNN, etc.). Two basic discussions have to be distinguished here. One is the discussion about whether local content providers will continue to provide local content. The second one is whether they will be able to remain financially independent. In the long run then, eventual inter-dependencies between financial control and content control have to be considered.

Some of the lessons learned from industrial development patterns in Latin America over recent decades, suggest that the existence and the fast internationalization of large multinational companies, presents a major challenge for local companies, if they want to remain independent. The few– often still family based— media groups in the region are comparatively small and weak in comparison to media giants like AOL-Time Warner, Bertelsmann, Vivendi Universal, Walt Disney, Viacom, News Corp and Sony. Each one of those multinational conglomerates has a market volume of more than US$ 20 billion each year, topping Latin American media companies by far. In reference to the automotive industry, these companies are like the General Motors, the VWs, Fiats and Fords of the sector and might take over Latin American media companies bit by bit.

While this is surely positive from an economic point of view (fresh foreign investment, know-how spillover, etc), it is worthwhile to underline again, that the media industry always requires special treatment, given its weight in the political life of a country, its influence on domestic culture and social life. Discussions about "national identity" get involved here, which makes the issue very delicate.

While the logical response is to call for protective legislation, the ICT-based global information infrastructure breaks any eventual and existing attempt to protect the domestic industry through an import-substituting legislation. Considering this and considering the power of multinational media giants, from the purely economic point of view in market based capitalistic system, there seem not to be many alternatives to the process of media concentration. The segmented media content industry in Latin America and the Caribbean does not allow sufficient scale to compete successfully on an international level. Neither does it permit enough negotiating powers to enter shared-management cooperations or stable strategic alliances with their multinational counterparts on an even playing field.

A possible alternative is to create scale in the region itself, in order to increase the regional negotiation power in this process. The segmented media market in Latin America and the Caribbean is making it very easy for multinational companies to compete or to take over the different (comparatively small) companies one by one. Joining forces and creating scale through alignment and conglomeration building in the regional media market would enable local content providers to face the challenge. While scale in regional media production cannot prevent multinational media giants from entering the local markets, it would nevertheless increase the negotiating powers of the domestic media companies and enable strategic alliances among equals with their counterparts form the United States, Europe or Asia. It would also allow them to foster a regional content export industry, which evidently is a very profitable business in an increasingly digitized and worldwide Information Society.

However, while joining forces of regional media companies presents an effective and market-based policy for the protection of the domestic cultural industry as a whole, it needs to be weighed against the danger of media concentration all over Latin America and the Caribbean itself. It needs to be assured that the result of such a regional alliance will not be the creation of a regional media monopoly. Concrete regulation and specific cooperation between the different national governments in Latin America and the Caribbean can provide this assurance.

Summing up, Latin America and the Caribbean have to be aware of the significance and potential powers of the media industry in an Information Society. The trend of media concentration is a challenge to regional media companies, national legislators and the regulatory bodies of regional trade unions and the WTO (OBS, 2001). It is not only a question of regulating global and regional trade in the information and entertainment industries, but also one of the protection of freedom of speech and democracy, cultural heritage and national identity.

Chapter V

Policy Agenda for the Information Society in Latin America and the Caribbean[1]

The advent of modern Information and Communication Technologies (ICTs) and the establishment of a global "Information Society" are forcing countries of all shapes and sizes to take a fresh look at their development agendas. The changes that ICTs introduce to the economy and production systems, public administration, the health sector, cultural participation, education and the media, present a great challenge and at the same time a great opportunity for organizations and citizens all over the world. For developing countries, the goal has to be not only to "prevail in the course of evolution" –meaning not to fall farther behind—but rather to use the present structural changes as a chance to catch up. Adequate policies, which involve all stakeholders in an Information Society, need to be put in place, aiming for a smooth and rapid transition.

A. Strategies for an information society

The establishment and implementation of regional, national and local Information Society development strategies are indispensable in order to seize the "Digital Opportunity". "Leapfrogging" development stages is possible, however, it is not an automatic process. Market mechanisms by themselves rather tend to deepen the Digital Divide between and within

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1 The presented policy conclusions are written by Martin R. Hilbert. They are based on the findings and expertise of the different articles in this book and a number of other studies on the subject. The author would like to thank the researchers of the various contributions for their valuable input.

WHAT STEPS SHOULD BE TAKEN IN DEVELOPING COUNTRIES
TO ADDRESS THE CHALLENGE OF "BUILDING AN INFORMATION SOCIETY":
EXECUTIVE SUMMARY

Strategies for an information society:

Establish and maintain national and regional Information Society programs, which integrate the interests of all stakeholders of the Information Society, namely the public sector, the private sector and civil society, be it on a local, national, regional or global level.

Building the infrastructure layer:

Pursue an integrated approach in the build-out of the Infrastructure Layer (involving all different actors of the telecom— AND hardware markets); Exploit the full potential of ICT-convergence (digital TV, 3G mobile, powerline, etc.). Promote the creation of one or several "regional hubs" for IP traffic, with sufficient capacity of peering with Tier 1 operators.

Building the generic service layer:

Assure the provision of adequate software tools, preferably based on open-standards; set up mechanisms to overcome the short-term financial and organizational requirements of their implementation; support the establishment of a strong ASP industry.

Regulatory frameworks for an information society:

Assure the creation and maintenance of high performance Infrastructure and Application Layers, through sophisticated regulation; adjust the juridical framework to enable digital practices in the Vertical Sectors through a program of region-wide cooperation, with special attention paid to security and privacy; focusing on adequate intellectual property rights regimes.

Financing an information society:

Build a new international finance infrastructure to balance the severe impacts of worldwide booms and crises in the region; strengthen local investments and Venture Capital mechanisms; consider access to information through ICTs a 'public good' and search for public finance mechanisms to deliver it.

Human capital for an information society:

Set up ICT training and usage incentive mechanisms for providers and consumers of e-practices; recognize and promote tacit knowledge as the decisive competitive advantage in the Information Society; foster the formation and support the preservation of a rightly-skilled workforce.

Digitizing the economy:

Promote academic and private sector research about and for the digitization of business processes in developing regions; support the establishment and functionality of B2B, especially among small and medium-sized enterprises; encourage and enable the banking sector to take a lead-role in e-commerce development.

Digitizing government:

Make the usage of ICTs an essential part of State modernization projects; set up an inter-ministerial e-government project team, which provides

(continued)

What steps should be taken in developing countries address... (concluded)

strong leadership in close cooperation with the private sector on the one hand (top-down), and on the other hand allows active participation of municipalities and the civil society (bottom-up).

Digitizing the health sector:

Make e-health an integrated part of current health sector reforms and avoid treating the issue as an isolated project; build on and integrate existing information systems; assess the appropriateness and quality of e-health services; provide special legislation for privacy protection and security in the health sector.

Digitizing culture:

Promote ICTs as a tool for cultural participation, especially regarding traditionally excluded groups in a society, such as indigenous groups, old people, women and children; encourage investigations and campaigns to stimulate discussions and awareness about the cultural dimension of digital communication.

Digitizing education:

Define the precise goals for e-learning projects; promote the development and sharing of educational software; provide incentive mechanisms for the teachers to integrate ICTs in their personal pedagogic approach; Institutionalize real-time knowledge-transfer from the Worldwide Web to local classrooms.

Digitizing the media:

Consider the unique position of the media industry in the Information Society; joining forces to create scale in the regional media industry in order to protect local content providers and to establish an internationally competitive information and entertainment industry in the region.

Source: Martin R. Hilbert

societies. To prevent this from happening strong and visionary leadership is required, reducing coordination costs and uncertainty.

On a national level, the establishment of a national authority that acts as a coordinating agency is the first step. It is paramount that the role of this national Information Society initiative is well defined, in order to prevent overlapping responsibilities. Harmonic cooperation or power-struggles between the different authorities involved in the national Information Society Program can be the decisive factor between success and failure of the effort.

It is essential that the eventual governmental initiatives embrace **the entire government**, which includes the different Ministries, as well as local municipalities. The establishment of an inter-ministerial institution seems advisable to achieve this goal. It needs to be assured that the program becomes an **initiative of the State**, not merely the current government in power. However, the most important factor is that national Information Society development strategies do not only aim for integrating the entire public sector (including all regulatory and technical authorities) into their decision taking, but also the private sector, civil society, and regional and global organizations. Cooperation with foreign governments, multi-lateral lending agencies, trade organizations and other intergovernmental organizations needs to be employed as a strategic tool for the creation of a domestic Information Society. **Private-public sector partnerships** and **civil society participation**, should not be misinterpreted as a division of labor, where the private sector is expected to merely provide funding, civil society organizations provide democratic accountability and the public sector allocates the "donated" resources. Such a division of labor is not sustainable in the long run. In order to navigate the long way towards an Information Society, **common visions** about future development trajectories need to be found and implemented together. The concerns and interests of civil society need to be addressed at the highest level of policy making. The private sector's focus on profits (at least in the long term) must be respected and addressed, while the public sector and civil society need to ensure that no part of society gets excluded from the benefits of progress.

The work of such a national Information Society program does not necessarily require tremendous financial support. Its work should rather focus on **creating synergies, linkages, cooperation and coordination** among the many stakeholders of a national Information Society, and on joint decision taking.

PUBLIC-PRIVATE COLLABORATION: PROFILE OF THE *COMITÉ CONSULTIVO DE TELECOMMUNICACIONES* IN CHILE

After taking office at the beginning of 2000, the new Chilean administration of President Ricardo Lagos created a voluntary telecommunications consultancy committee (CCT: Comité Consultivo de Telecomunicaciones), through which 70 industry representatives co-operate with the Telecommunications Undersecretariat, Subtel, in the development of telecommunication services in the country. Whenever a new Task Force (Grupo de Trabajo; GT) is established, the President of CCT invites all representatives to an initial hearing. Interested parties can voluntarily join the Task Force. The GT elects a president who is in charge of the administration of the group. The elected president has to be from the private sector. A representative of Subtel participates as an observer in the meetings of the Task Force. The Task Force prepares a report or position paper that, once ready, is circulated to all industry representatives by the President of the CCT for comments. The report is later handed to Subtel and the Ministry of Transportation and Communication, which takes it into account in the preparation of ruling legislation, related to the subject considered by the Task Force.

Source: Martin R. Hilbert and Ben Petrazzini, «3G Mobile Policy: The Cases of Chile and Venezuela», International Telecommunications Union (ITU) (http://www.itu.int/osg/spu/ni/3G/casestudies/chile-venezuela/Chile-Venezuela.PDF), 2001.

On of the main goals of such a far-reaching and all-embracing initiatives is to **minimize the duplication of efforts**. In many cases, the introduction of ICTs into the organizational structures of different sectors (be they e-government, e-health, e-learning, etc) is not an integrated part of the existing modernization reforms. In Latin America and the Caribbean e-health initiatives exist "on-top" of the established health sector reform models, in the same way as e-government projects exist parallel to state modernization reforms. Computer labs in schools are not sufficiently integrated into national curriculums and rather function as a voluntary activity besides educational reforms. One of the most frequent reasons for this loss of resources is that the discussion becomes a debate about technology and computation, and not about administrative efficiency, transparency, governance and pedagogic approaches.

Another factor which Information Society initiatives need to take into consideration is the need to define **precise goals** and objectives, that should be developed in cooperation with users to reflect needs and priorities that have project performance benchmarks. ICTs permit the coverage of a vast range of necessities. Nonetheless, it is fundamental to concentrate efforts on some of them, in order to prevent confusion and disorientation, which leads to decreasing motivation and fading political and financial support of such programs.

Many Information Society strategies require an **international focus**. The cross-border character of the Internet does not permit policies that are limited to national frontiers. For many policies it is advisable to have a sub-regional, regional and a global focus. In **international initiatives**, "meaningful participation" [2] of developing countries has to be assured, and Latin America and the Caribbean needs to ensure it gets involved, contributes and benefits from such international initiatives through "meaningful participation". Furthermore, tailor-made attention on a **regional** and **national level** is paramount, since technical change and eventual leapfrogging strategies are interwoven with its physical, historical, social and institutional environment. The 'heritage from the industrial age' provides different starting points, in different regions and countries. In order to assure that existing assets are incorporated and fully exploited, it is paramount to encourage participation of all the stakeholders in an Information Society in such an initiative. **Sub-regional** projects, such as in the Andean Community, MERCOSUR, CARICOM and the Central American Common Market are essential (see Box). However, some of the challenges of the ICT infrastructure are best faced on a regional or even global level.

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[2] United Nations Information and Communication Technologies Task Force; Working Group 1; http://www.unicttaskforce.org/groups/members/public.asp?cod_tema_menu=30

REGIONAL COOPERATION FOR ICT INFRASTRUCTURE: THE MESOAMERICAN INFORMATION HIGHWAY (AMI) OF THE PLAN PUEBLA-PANAMÁ

The project tries to develop a strong broadband telecommunications infrastructure that would foster improvements in communications among the Central American countries, the southern and southeastern Mexican states and the rest of the world. In Central America, the construction of the regional "backbone" should be completed, allowing the broadband network to link more than 40 cities, including the capitals, main ports and airports, using high-capacity fiber optic cables. In turn, this project seeks to help the region in the development of ICT policies and regulations, strengthening regional institutions and cooperation among countries, and promoting dialogue between the private and public sectors. Technical assistance would be required in the following areas: (i) the strengthening of the institutional procedures and structure for formulating ICT development policies; (ii) the development of harmonized national and regional telecommunications regulation; and (iii) the development of regulations in areas such as consumer protection, intellectual property rights and security.

Various international organizations are actively working on the issue of legislative **standards to facilitate online activities**. For example, the International Standards Organization (ISO) coordinates its work with the International Electrotechnical Commission (IEC) through a Joint Technical Committee (JTCI) on Information Technology. The joint work includes the development of criteria for mutual acceptance of certification authorities, trustworthy third parties, electronic signatures and cryptography. Treaty-base organizations like the ITU participate actively on the development of standards and telecommunication networks-related issues. Regional bodies such as the Inter-American Telecommunications Commission (CITEL) work on an Inter-American Mutual Recognition Agreement for the Conformity Assessment of Telecommunications Equipment (FTAA, 2000). Latin America and Caribbean countries should keep participating actively in these international and regional forums defining rules and technical standards for the Internet. This, in turn, requires a degree of familiarity with the issues and the technology that is lacking in many countries in the region. Cooperation among countries and pooling of their technical resources can help overcome this handicap. It is also essential for Latin American and Caribbean countries to defend their interests and to play an active role in WTO future negotiations on e-commerce treatment.

Another one of the many areas that can benefit from regional cooperation is the creation of **negotiation power**. It is crucial to create scale in demand in order to be heard by large multinational companies. With more than half a billion inhabitants and a GDP of US$ 2 trillion, Latin America and the Caribbean represents an attractive market for ICT and ICT service providers. The lack of coordination between the markets in the region, however, makes it easy for multinational conglomerates to discriminate in pricing and to exploit market segments to the maximum. Grouping together to lever negotiation and purchasing powers in Latin America and the Caribbean would enable the region to tackle and to discuss problem areas that bottleneck and to address the rapid and universal integration of ICTs in the region. The previously mentioned inequitable and unjust pricing system for Internet traffic flows and the required negotiations with North American Tier 1 operators,[3] is one example that needs urgent attention. Another field that requires bulk negotiations with large multinational companies is software licensing. Discount rates for software programs and "social-licenses" can serve poor communities, public facilities and micro-enterprises. Negotiations with multinational computer companies about the production of special hardware equipment (or hardware equipment parts which can then be assembled locally) can help to provide ICT equipment that is adjusted to the minimum requirements of sophistication and price. Available end-user equipment is often overpriced or includes unnecessary functions for specific socioeconomic applications. The profit margins for multinational companies in providing simple and cheap equipment might not be as large as with sophisticated high quality products. However cheap and sufficiently sophisticated access equipment is essential to provide basic access to the ICT infrastructure for all socioeconomic spectrums in Latin America and the Caribbean. Especially with respect to the introduction of 3G mobile telephony and digital television, such negotiations become a crucial part of the Digital Divide policy agenda. Public-private sector networks (such as the UN ICT Task Force, which acts in Latin America and the Caribbean through "LacNet") can provide an adequate forum to tackle such delicate but pressing issues.

B. Building the infrastructure layer

A rapid build-out in the Infrastructure Layer is not only necessary to reduce the risk of creating new forms of socioeconomic inequalities (Digital Divide), but also to overcome "chicken-and-egg" scenarios between lacking online participation and content creation in the Vertical Sectors. Policies to narrow the **Digital Divide** in the Infrastructure Layer need to aim toward increasing investment and lowering variable and fixed-cost access prices. This can be attained in a number of different ways. Firstly,

[3] A Tier 1 Internet Service Provider is a backbone operator and refers specifically to the very largest ISP backbone providers.

short-term initiatives and pilot projects ("micro-policies") need to aim for fast results, by lowering individual access costs through public and shared access models or by particular cooperation mechanisms (for example computer recycling). Secondly, long-term "macro-policies" need to consider all different kinds of access alternatives (such as traditional Internet, 3G mobile telephony, digital TV, powerline, etc). Different technological solutions to access ICT infrastructure need to remain in healthy competition with each other. Furthermore, the provision of hardware and the performance of companies in the **hardware industry** are often neglected. While the focus is set on affordable telecommunications, high hardware prices are a major obstacle for access to the Infrastructure Layer in Latin America and the Caribbean.

The increasing importance of **IP traffic** and the lack of peering agreements with North American operators has resulted in Latin American and Caribbean IP network operators bearing the majority of Internet connectivity costs to and from North America (which represents 60% of total Latin America and the Caribbean Internet traffic). The creation of one or several "Latin American and Caribbean hub(s)" would be an adequate solution to prevent this from happening and would favor the development of the Infrastructure Layer in the region. However, the creation of a "Latin America and Caribbean hub" would require joint forces in the domestic telecommunications sector. This also carries the risk of creating monopoly-power in the region, which would then prevent the benefits of the hub from being passed on to consumers. Open dialogue between governments, telecommunications regulatory bodies and operators is required to address this urgent issue.[4]

Besides the "traditional Internet", technological advances open up new alternatives to access the "heart of the Information Society". Given the high TV penetration and the high familiarity with the TV technology in Latin America and the Caribbean households, the introduction of **digital TV** presents a great opportunity for the region. The first step in the transition from analogue to digital TV is to select a national platform. The decision about an adequate platform standard in a technological system has to go far beyond technical considerations. Issues that need to be considered include the impact on the domestic industry, the possibility of equipment production and royalties, the cost of implementation and the time-to-market

4 Regional public sector institutions like Regulatel *(Foro Latinoamericano de Entes Reguladores)* and private sector associations like Ahciet *(Asociación Hispanoamericana de Centros de Investigación y Empresas de Telecomunicaciones)* provide adequate forums to do so.

of each system. Other issues include the cost of receivers, forecasts about the time expected before receiver prices come down as well as other contributing factors that favor universal access. A central lesson to be learned from the heterogeneous situation of analogue television in Latin America and the Caribbean is that a **common technical platform** for digital TV in Latin America and the Caribbean could be decisive in boosting the flow of content in the region.

Another potential alternative to access the Infrastructure Layer is **mobile communications systems**. However, to extend mobile data services so they benefit the entire society in the region, will require major changes in the region's approach to the mobile industry. Issues that need to be addressed include how to overcome the challenges of urban concentration of mobile services, how to provide services to low-income groups, and what should be done about declining market conditions and stifling tax burdens. What should be done about high license fees, a lack of coordinated spectrum (especially with regard to **3G**), an uncoordinated approach toward standards issues and preference for wire line over mobile subsidies. These issues require a cold appraisal on the basis of a public-private partnership that will allow mobile telephony to continue its current growth in the region.

WORKING GROUP ON MOBILE AND WIRELESS

To allow mobile telephony to continue its current growth rates requires raising awareness about the potential mobile communications have for social development. Political and economic support for mobile ICTs is very low in Latin America and the Caribbean (and actually in all of the Americas). The promotion of mobile services remains a secondary topic, currently discussed in two permanent consultative committees of CITEL that meet separately. There are no concerted efforts within the regional body to use mobile technologies to reach broader telecommunications goals. The institution of a mobile and wireless public services working group within the CITEL, to seek ways through which mobile communications could contribute to the connectivity agenda and other major initiatives. It would also allow administrations to take full advantage of mobile ICTs' unique capabilities and cost-effectiveness. Included in its agenda would be proposals related to mobile-Internet, cheap end-user equipment, applications for mobile services (especially for social uses), mobile-commerce, emergency services through the mobile interface, as well as the regular attention to international roaming and fraud.

Source: Richard Downes.

C. Building the generic services layer

The provision of adequate software tools and services is a major issue. Market mechanisms are often not sufficient to create programs that serve broader development goals. The market may produce video games and adult entertainment, but not necessarily adequate tools to confront local needs in health care or educational services. This is a classic example of market failure that justifies government intervention. Open and **international standards** are key to assure interoperability in the Generic Service Layer and to not create closed and separate user circles. Open standards can also play an important role in the provision of adequate software tools in a local context. Innovative applications based on open source software encourage the adjustment of programs to local characteristics of a society and promote local innovation in software programming. This also implies that a minimum level of local programming capacity is indispensable, to assure the adjustment of applications to domestic requirements.

OPEN STANDARDS FOR DIGITALTV

As with PCs and advanced digital cell-phones, digital TV needs to be supported by some kind of software in the "Generic Service Layer". It is important to assure that an **open standard** is chosen as the **API** (Application Programming Interface) for digital TV, in order to not repeat the mistakes which have been made in PC software markets. Especially in developing countries open standards are essential to prevent the creation of "lock in" effects and to assure the introduction of an "Internet" open to all in digital TV networks. All stakeholders involved (consumers, local industry, and international investors) can only benefit from the many opportunities an open digital TV Interface brings with it. It would also facilitate the production of adequate content and business models for a technology that might affect up to 90% of the LAC population directly, in the near future.

Source: Martin R. Hilbert

Regarding the usage of digital services, in Latin America and the Caribbean most attention is put on the digitization of outer-firm processes (such as digital communication and coordination through B2B or B2C marketplaces or online portals), while the challenge of digitizing internal mechanisms in organizations is neglected. An urgent and important task is the introduction of software programs and information and communication systems into the organizational structure of small actors (such as SMEs, municipalities, small hospitals and schools, etc.).

However, up-front costs of internal software systems are very high, their implementation requires a large effort (3-18 month projects) and causes profound changes in social and productive organization. While the long-term productivity gains greatly exceed the required initial investment, the

DIGITIZING INNER- AND INTER-ORGANIZATIONAL COMMUNICATION AND COORDINATION PROCESSES

In many developed countries, the process of digitization started "**in-house**", before moving on to "interconnecting different actors". In Latin America and the Caribbean on the contrary, a large part of the organizational units wrote their first email before introducing their first electronic database. This goes for firms, as well as for schools, hospitals, ministries, etc. The lack of internal application systems is a major obstacle to the adoption of more advanced inter-organizational applications. Digitizing information flows, communication processes and coordination mechanisms inside an organizational unit makes a large contribution to the overall efficiency increases and greatly facilitates the adaptation of inter-organizational online practices. The benefits from Internet marketplaces and online activities between actors in Latin America and the Caribbean will remain limited as long as the vast majority of the internal organization takes place with a "paper and pen".

Source: Martin R. Hilbert

short-term financial and organizational requirements (such as the provision of an implementation team) may be too high, especially for small agents. It is necessary to also provide **short-term incentive mechanisms or loans** to motivate small organizations to make the necessary investments and organizational adjustments.[5]

With world-class ERP solutions ranging from US$ 100,000 to US$ 2 million at the beginning of 2002 (excluding implementation and labor training costs), the possibilities for small —and medium— sized organizational units to access such technological systems were very restricted. The business model of **Application Service Providers (ASP)** reduces the cost of such services.

REDUCING COSTS AND IMPROVING QUALITY THROUGH APPLICATION SERVICE PROVIDERS

The ASP model reduces the cost of acquiring and up-dating software applications by sharing infrastructure, service organization and maintenance costs. By deploying preconfigured solutions and shared training, implementation costs are also reduced. Furthermore, liability and enforcement assurances from the service provider guarantee the client the functionality of the system and provide a constant up-date of applications in an industry where performance goes out of date very fast. Therefore a well functioning and strong ASP-industry is essential to provide high quality application services to a large part of organizations in Latin America and the Caribbean. The creation and maintenance of the industry deserves special attention.

5 These incentives need to consider the full cost of the implementation of application systems (hardware, telecoms, software, implementation services, capacitation and training, reorganization, etc.).

D. Regulatory frameworks for an information society

The regulatory challenge to foster the creation of an Information Society is three-fold. First of all, the Infrastructure and the Generic Service Layers need to be regulated. This involves the regulation of the telecommunications and hardware industries, as well as assuring the functionality and high performance of the software market. Secondly, it requires the adjustment of the juridical framework to enable digital practices in the Vertical Sectors. And thirdly, basic rights need to assure the morality and viability of human interaction in the Information Society. As such, intellectual property rights regimes are needed that recognize the characteristics of a Digital Economy and an Information Society.

A well-functioning and well-regulated **telecommunications industry** is key in the process of building an Information Society. Unlike many developed countries, the majority of Latin America and the Caribbean telecommunication industries were privatized at a time when the infrastructure penetration was still very low. Regulation mechanisms therefore also differ from those applied in markets that have already reached an almost complete penetration. Incentive mechanisms need to be found which foster the **growth of the network** and assure universal inclusion of access. One of the most difficult tasks in telecommunications regulation in Latin America and the Caribbean and elsewhere in the world is to find an adequate and sustainable level of competitiveness (workable competition). This competitiveness should allow the operators, on the one hand, to make sufficient profits to justify further investments in the network build-out and on the other hand to seek low prices and high service quality.

REDUCING UNCERTAINTY IN THE TELECOM INDUSTRY THROUGH STRONG INSTITUTIONS

Experience shows that the existence of an antimonopoly or **competition body** creates positive dynamics. However, the lack (or at least an unsatisfactory performance) of such an antimonopoly institution in many Latin American and Caribbean countries, creates an institutional vacuum in telecommunications regulation. Furthermore, the long-term investment cycles in the telecom industry require stability in telecommunications regulation. Telecom regulation has to become a **policy of the state** (not of a particular government in power) which reduces uncertainty and establishes trust in the sector.

Source: Martin R. Hilbert

The omnipresent significance and the potential strategic power of **technical standards** are often underestimated in technological development strategies in Latin America and the Caribbean. The neglect of this issue and the uncoordinated search for foreign investments has created a uniquely challenging standard scenario in the region, which could present a serious obstacle for smooth technological development in the future. The suggested policy is three-fold. First of all, before introducing a new technological system (such as 3G or digital TV) an **institutionalized process of testing** has to identify the best solution to the particular situation. Such a mechanism needs to take the process of ICT-convergence into consideration (which implies for example the interdependency of 3G systems with digital TV systems, given that they will eventually converge). Brazil's extensive experience of testing digital television standards during 2000 is a best practice in this respect. More countries in the region should participate in such standard testing mechanisms, and the high costs of such tests could be shared on a regional scale. Secondly, at a later stage, such a regional mechanism could also evaluate the costs and benefits of **proprietary standards versus open standards** for the different technological solutions in the market. Constant and profound economic analyses are absolutely necessary for deciding on this crucial question. In principle, open standards should be favored, since they prevent "lock-in" effects, assure low intellectual property royalty payments, foster integration and interoperability and therefore lead to industrial participation, competition and scale on a common platform. Thirdly, it also becomes essential for Latin America and Caribbean countries and companies to **participate in standard** consortia worldwide. Open standards in mobile telephony (such as GSM) and for digital television (such as DVB) have been created through such consortia over the last decade. Many of those consortia welcome participation from other countries. This would assure that the special characteristics of the region are considered when a new standard is created. Furthermore, through the close cooperation with countries and companies on the technological frontier in such consortiums, Latin America and the Caribbean could convert from being a "standard taker" into becoming a "standard maker".

The adjustment of the **juridical framework** is key. In theory, a less rigid regulatory environment in Latin America and the Caribbean (in comparison to stiff regulatory environments in some developed countries) should provide the region with the chance to move a lot faster in **adjusting** its **regulatory framework** to the needs of the digital age. In practice however, the low priority given to the issue results in lacking or inadequate legislation in Latin America and the Caribbean and is a major obstacle for the adaptation of e-practices. Adequate legislation is a basic requirement for digitization. Such a juridical framework includes digital signatures, online contracts, electronic certificates, network security, credit card and e-payment fraud, cyber-crime in general, online consumer protection, intimacy and privacy rights, authentication, liability and data integrity.

ENABLING DIGITAL TRANSACTION ACROSS THE REGION

Digital transactions often take place cross-borders and the current heterogeneity of legislation throughout the region presents a severe obstacle for cross-border e-practices, and therefore for the full exploitation of the digital opportunity. A **program of cooperation** should be established on a regional level in Latin America and the Caribbean, to promote the convergence of regulatory frameworks. With regard to the limits of the Model law on electronic data interchange of UNCITRAL, a forum should be created on a regional level (for example through OAS or Grupo de Río). This forum would analyze and discuss issues like the non-discrimination between the recognition of electronic and hand-written documents, technological neutrality and harmonization of digital signature legislation, or the institutionalization of a system of certification entities that establish similar requirements for electronic certification and the mutual recognition of them.

Regarding subjects that require a regional coordination and are not covered by the model law (especially the trade of digital goods and services, taxation issues, consumer protection, cyber-crime and fraud and data integrity) forums should be created on the basis of existing integration processes (especially Andean Community, CARICOM, Central American Common Market and MERCOSUR). The directives and recommendations of the European Union could serve as a basic model for these groups. Such a model would especially serve regarding the definition of the judicial nature of electronic contracts; consumer rights; definition of which legislation should be applied in digital cross-border transactions (the country of origin or the country of reception); the establishment of norms for e-payment to provide security and a climate of confidence in e-practices).

Source: Martin R. Hilbert and Manuel José Cardenas

The role of **intellectual property rights** in the transition towards an Information Society is essential. An **incentive regime** is needed, which balances the need for an adequate rate of profits from research and development (R&D) expenditure and a requirement of society that patent holders do not overexploit dominant market positions. Such a regime also has to recognize the special characteristics of digital goods, such as non-rivalry and non-excludability. Furthermore, closely related to the above-mentioned **technical standards**, the risks and benefits of "closed" vs. "open standards" need to be evaluated constantly. And finally, the stakeholders of the Information Society in Latin America and the Caribbean should not underestimate the importance of trustworthy **Internet governance** and domain name system management.

E. Financing an information society

The necessary resources that have to be generated in order to finance the establishment of an Information Society in Latin America and the Caribbean require the joint effort of the private and the public sector.

FINANCING IN A TIME OF CRISIS

LAC is very sensitive and **vulnerable to worldwide economic trends**. A worldwide economic downturn has been shown to have disastrous and multiple effects on regional finance mechanisms. After worldwide high-tech stock markets crashed in 2000, the formerly extraordinarily high Venture Capital flow into Latin America and the Caribbean stopped completely. Also, foreign investment flows towards the region diminished decisively between 2000 and 2002. Latin America accounted for 4.5% of worldwide telecommunications spending in 2000 and experienced the world's largest cut back of global telecom carrier expenditures between 2001 and 2002 (62%). However, foreign direct investment and venture capital continue to be indispensable for financing the creation of an Information Society in the region. The "ICT evolution" continues, driven by the forces of ICT-convergence. This requires resources to build out the Infrastructure Layer, the same as financing mechanisms assure capital for the Generic Services Layer and the different Vertical Sectors. Building out wireless and mobile infrastructure (especially 3G) and the adaptation of digital television will require significant amounts of investment in the years to come for Latin America and the Caribbean. The creation of adequate content and new business models (such as for digital TV or for 3G) requires flexible venture capital mechanisms. If the region does not want to fall too far behind in these ongoing developments, strong and stable financing mechanisms and markets are indispensable.

In the long run, a new **international finance architecture** will be needed, to balance the serious impacts of worldwide booms and crises in Latin America and the Caribbean (Ocampo, 2001b) and to assure a constant minimum flow of capital to the region. The assurance of adequate finance mechanisms for the transition towards an Information Society in developing countries, should be part of this global program.

In the short term, one of the best ways to encourage foreign investment seems to be by increasing the amount of local investment. Foreign investors will be discouraged from investing in the region if **local investor participation** does not increase. Governments must put mechanisms into place to encourage the private sector to invest in local capital markets, rather than sending money offshore to more secure markets. Experience in other countries (especially in Israel)[7] shows that governments themselves can act as a catalyst for emerging Venture Capital markets. The deployment of ICTs and digital networks itself, can be used

[7] In the early 1990s the Israeli government set up a Venture Capital company, Yozma, to act as a catalyst for the emerging industry. With a budget of US$ 100 million, Yozma invested in local companies and attracted foreign capital. The fund is a model for the state-led emergence of a Venture Capital and high-tech industry.

to assure a better, **more transparent and more flexible** allocation of **resources** in capital markets of all shapes and sizes in Latin America and the Caribbean. Such "e-Finance" networks present a special opportunity for micro-enterprises and SMEs.

Furthermore, more advanced security laws to protect minority shareholders rights are required. Bankruptcy laws need to be streamlined in order to give creditors the needed security to encourage additional lending. Corporate governance **regulations also need to be put in place**. Courts have not been protective of these rights, because of the lack of a well-defined legal body in this respect. Effective financing mechanisms also need to address issues that are particular to business cultures in certain countries. For example many Latin America and Caribbean companies are family-run businesses and their owners have traditionally been insensitive to the needs of minority shareholders.

Considering historical evidence of the spread of TV and radio receivers in the twentieth century and the present socioeconomic characteristics in the region, it seems very unlikely that the Digital Divide will be closed in the near future, if the transition towards an Information Society is solely guided by market mechanisms. Government intervention is needed. In order to accelerate the process of ICT diffusion, the **public sector** in low-come countries will have to find creative ways to efficiently use the limited resources available to ensure a **minimum level of ICT access** for the entire society. The public sector will need to carry out detailed evaluation and implement visionary policies regarding the creation of **public goods**, shared access, **cross-taxing incentives** for nascent industries (including the industries in the Horizontal Layers, as well as in the Vertical Sectors) or "**paternalism**" that aim to accelerate the adoption of the new paradigm. The risk to create another form of inequality and exclusion when leaving development completely to market mechanisms, is too high.

F. Human capital for an information society

Two directions of policy have to be considered to address the challenging task of creating "Human Capital" to serve in an Information Society.

The first one centers on **training issues**. Analysis from the Vertical Sectors has clearly showed that the usage of ICTs and the adaptation of digital practices require a **learning process** (on the supply, as well as on the demand side of online exchange). Public sector authorities, private sector entrepreneurs and third sector leaders, who aim for the integration of e-practices, need to assure that employees, as well as clients and members are constantly trained to adapt to the ever-changing e-environment. Public mechanisms have to give incentives to private investors to invest in training that fosters the adoption of digital practices, for example through tax-incentives for the institutionalization of ICT training.[8]

USING ICT REQUIRES TRAINING

Training of human resources and awareness programs for staff members have proven to be important in e-Sectors, since opposition to change from professionals is frequently a major obstacle to deployment of ICTs. This accounts for civil servants in e-government, physicians and health professionals in e-health, teachers in e-learning and employees in companies.

Training strategies need to identify **target groups** on the basis of the functions and training needs in the specific Vertical Sectors and Horizontal Layers (e.g. in the health, the governmental and business sectors; or telecommunications and software). Training programs need to be developed to meet the needs identified in a specific target group. One useful approach would be to establish a network of training focal points that takes into account the specific organization and circumstances of local characteristics.

One highly effective technique is dynamic and proactive **cooperation within the academic sector** (especially integrating universities). A very cost-effective solution is to create a university network for technical assistance and for education purposes (for example for training high-school teachers, doctors, entrepreneurs of micro-enterprises and SMEs, etc.). To institutionalize such a network requires reliable coordination. Introducing a "hierarchy" in the training network (where educators train educators in an ongoing chain) proves to be efficient.

E-learning mechanisms can be used to help in training process. For example, cost effective e-learning solutions that can help to reach a wider audience, including: distance education, virtual consultancy portals or educational and informative Intranets for health professionals, micro-enterprise— and SME entrepreneurs, teachers or public sector authorities. Such virtual information and education mechanisms should not only be deployed for professionals but also for consumer education.

Source: Felipe Jara.

The second direction in which Human Capital policy should be aiming is the creation of "tacit knowledge." This policy is intended to gain a competitive advantage in a society where information is widely available through digital networks. It involves the notorious "**brain drain**". While mobility of the workforce cannot be prohibited in an increasingly globalized

8 An example from the e-commerce section (Magazine Luiza from Brazil) showed that training could even become a substantial part of an e-commerce business model, and therefore benefits the company and its clients.

and free world, incentives need to be found to motivate highly skilled professionals to stay in low-income countries. Sharing ownership and responsibility with professionals, are two first steps. Trusting and building on the future generation of young professionals, instead of loosing them, requires a change in business culture. This presents a major challenge for Latin America and the Caribbean, where the hierarchical organization of many (family-run) enterprises bears the potential to motivate young professionals to leave their home country.

THE INFORMATION SOCIETY COMPETES THROUGH TACIT KNOWLEDGE

Existing education mechanisms also require more attention in Latin America and the Caribbean. The public sector's responsibility to provide adequate basic education to all of its society becomes more important in an economy that competes for tacit knowledge. **Public-private sector collaboration** in tertiary education is indispensable in order to provide updated content at an affordable price. Experience shows that a private sector that is interested in having a well-equipped local workforce can help to finance part of the expensive tertiary education. Creative ways have to be found to incorporate industry needs into tertiary education while at the same time avoiding training individuals in universities who are merely "experts" on a particular firm. However, even the creation of "firm experts" (especially through postgraduate studies) does not go completely against the goal of creating high quality human capital. After all funding should be competitive.

Public-private sector partnerships are also a necessary element in the creation of "**life-long-learning**" mechanisms, which implies providing links between the national education systems and the existing workforce. The concept of "life-long-learning" would even justify that the public sector re-budgets some of its expenditures on higher education, so that not only the 20-25 year olds can benefit from it, but also the 25-60 year olds. By involving the private sector in life-long-learning could lead to public subsidies and tax allowances for individuals and firms that invest in skills training. By motivating private firms to constantly invest in skills themselves, the public sector would also reduce the risk of presenting curricula that are out of date.

Source: Martin R. Hilbert

Since curriculums and study programs become obsolete very fast, identifying **professional profiles** which fit the special requirements of the particular industries in Latin America and the Caribbean imply a shared responsibility between education institutions, the public sector and the industry itself. Creating a network of representatives from all the different actors involved, which monitors and proposes adequate professional profiles, is indispensable to avoid the common "skill-mismatch".[9] Given that Latin America and Caribbean industries often have similar characteristics

[9] The presented project "Career-Space" shows an alternative through which a public-private sector partnership can help to identify adequate professional profiles that are in demand.

and requirements, such a monitoring network could even function on a supranational scale, in order to take advantage of synergies.

In many Latin America and Caribbean countries there are special agencies which support the training of the national workforce. Over the last few decades these "**national apprenticeship agencies**" have become powerful and recognized organizations that manage a considerable annual budget. However, at present they are ill-equipped to meet the demanding challenges of a workforce in the Information Society today and would need profound overhauling. These agencies would also be the right place to start private-public sector partnership initiatives and to identify adequate professional profiles. It would be a powerful policy to make these agencies fully functional services that create a well-equipped workforce for the Information Society in Latin America and the Caribbean.

G. E-Sectors

1. Digitizing the economy (e-business)

The main focus of e-commerce in Latin America and the Caribbean is currently on **B2B** transactions. B2C commerce is still small and is not expected to gain substantial weight until the "masses" are connected through new technological innovations (like for example digital TV). In many cases B2B commerce is also a basic requirement for developing B2C commerce, since "up-front" B2C retailing often entails solid B2B "back-office" mechanisms. In this respect, the focus needs to shift away from seeing the Internet merely as a "new sales channel", to one that is focused on the digitization of the entire business and commerce process, by integrating digitized inner-firm processes into an outer-firm network. However, at the same time, the region must remain aware of the structural changes that labor-saving technologies can bring in a region where low-cost, low-skill manual labor is a central facet of the economy and where high levels of unemployment or underemployment have historically prevailed.

The Brazilian experience shows that the **banking sector** can play a central role in the development of e-commerce, especially online transactions. Payment systems are crucial. Bank-sponsored or bank-facilitated online transactions help stimulate consumer e-commerce and create confidence in online activities. Direct and indirect support, incentive mechanisms and even obligations for the banking sector to invest or develop secure transaction systems prove very beneficial for the overall progress of online activity. Brazil's pre-eminence in e-commerce in the region is largely due to the country's advanced e-banking sector. The special

SPECIAL FOCUS ON SMES

There is a clear positive relationship between the size of a company and its ICT usage. However, evidence shows that small and medium sized enterprises (**SMEs**) adapt very quickly to e-commerce, mainly by adopting online business models which have been developed elsewhere. This underscores the benefits and the potential of the "quick follower". The structural importance of micro-enterprises and SMEs in Latin American and Caribbean economies and the high potential benefits of putting their business practices online, is an area worthy of attention for governments, public-private partnerships and multi-lateral lending agencies. Providing training, and financial— and technical support to micro-enterprises and SMEs to better integrate them into national and international digital supply chains is indispensable in order to break the "vicious circle" between usage and benefit, and to enter the "virtuous circle" of network externalities. Therefore the integration of micro-enterprises and SMEs in Latin America and Caribbean is essential to make regional economies become competitive in what is an increasingly globalized Digital Economy.

A **multitude of standards** in different online trading platforms (especially technical standards and standards regarding product definitions), present a major obstacle to fully integrating micro-enterprises and SMEs into local and international digital supply chains. Technical assistance is necessary, and in the medium-term a national strategy needs to be found to deal with this issue.

One principal concern about integrating SME e-commerce providers is insufficient online **security** mechanisms. It is fundamental to promote secure transaction technology and software within domestic enterprises. Consumer groups and business and trade organizations should mount education and awareness campaigns about the process and security of trading online. Taking these steps can help overcome consumer and business aversion to e-commerce.

Source: Martin R. Hilbert and Noah Elkin.

characteristics of Latin America and the Caribbean need to be considered (such as the low credit card penetration) and creative and alternative payment systems (such as mobile payment applications and smart cards) need to be used.

A large amount of **scientific research** is necessary to untangle and help to understand the functionality of the Digital Economy in Latin America and the Caribbean. Research centers and academic investigations are in high demand to analyze what can, and what cannot be done through digital networks in Latin America and the Caribbean. There is also analysis to identify bottlenecks and to underline best practices taking into consideration the special characteristics of the region. It is indispensable to create research networks between the public sector, private businesses and academia to accomplish this urgent task and to foster the understanding of digitizing business processes in Latin America and the Caribbean.

2. Digitizing government (e-government)

The digitization of public services holds great promise for performance quality and cost-effectiveness of public administration in Latin America and the Caribbean. It can also support the massification of the Internet, as experiences in Chile, Brazil and Mexico with "killer-applications" like online tax paying or B2G portals have shown to be decisive motivators for companies in their decision to go online. In the long run, e-Governments can contribute significantly to citizen participation in a democracy. In the short-term, digital organization in public administration can increase transparency and help fight corruption, which has been a long-standing concern in the region and the world. E-government initiatives need to become an integrated part of **existing state modernization reforms** and not be treated as a separate project. It is important to prevent the discussion from becoming a debate about technology and computation, but rather make it focus on public administration and governance. The entire spectrum of public sector activity needs to be incorporated in the efforts to digitize (including traffic regulation, police, fire departments, natural disaster prevention, etc.).

Generally speaking, e-government projects go through **five stages**, which start with the (1) digitization of administrative processes in the public sector, followed by (2) an increasing Web presence, (3) then an increasingly interactive online dialogue with the citizens, (4) to online transactions and (5) eventually to the integration of the e-government front-end interface ("one-stop-shop").

PARTICIPATIVE LEADERSHIP FOR A NEW FORM OF GOVERNMENT

To achieve success in an e-government project, realistic objectives, strategic planning and strong **leadership** are indispensable factors. E-government initiatives can greatly benefit from experiences in other countries and from experiences of the private sector. Cooperation with the private sector (especially in the technological field) is necessary, but not sufficient in itself. The government has to become the prime mover in ICT adoption. The internal resistance to such kinds of reforms should not be underestimated. To overcome this resistance requires leadership from the highest level of the public sector. However, an e-government **project team** needs to incorporate all the different stakeholders in public administration. The "top-down" approach needs to be balanced with a sufficient degree of "**bottom-up**" participation. New ways of public administration need to fit the actual citizens demand. Municipalities play a central role in this process and should become a focus of research and development assistance.

Source: Martin R. Hilbert and Claudio Orrego.

3. Digitizing the health sector (e-health)

The deployment of ICTs to improve performance in the health sector is widely neglected in Latin America and the Caribbean and the concept of e-health has not yet been adequately embraced and is often misinterpreted. E-health goes far beyond telemedicine and distance consultations. Similarly to what has been pointed out regarding B2B and B2C e-commerce, the "business-to-consumer" interaction of telemedicine is only a small part of e-health. The greatest challenges to implementing ICTs in health and healthcare are related to digitizing "back-office" processes, automating intra— and interorganizational health structures and creating digital networks within and **between** the different units of the national health sector.

In the light of current modernization and health reforms in Latin America and the Caribbean, e-health needs to be made an integrated part of each particular **health sector reform model** and not to be treated as an isolated project. E-health efforts must be aligned with healthcare organizational goals and priorities and must deploy technological architecture and infrastructure that is best suited to increase efficiency and quality of care in each particular implementation environment. **International cooperation** in the field of e-health has to consider the particular stage of development and characteristics of the national reform process in a developing country in order to provide assistance that is properly linked to the real needs of the sector.

The healthcare sector in Latin America and the Caribbean is a largely decentralized industry populated by diverse organizations with overlapping responsibilities and diverse and often conflicting goals, resources, and incentives. However, e-health solutions are complex and costly to develop and implement. **Coordination** among the different actors in the health sector is necessary in order to create synergies and economies of scale in the development of e-health applications and to exchange experience and knowledge to facilitate its implementation. Cooperative partnerships with the high-tech industry are very important. **Outsourcing** networks will need to become more common in the health sector in order to keep up with the rapid advances taking place in the area of ICTs.

In past decades, a great variety of information systems have been implemented in Latin America and Caribbean health and healthcare organizations. In order to boost their effectiveness and lower costs, such systems must be integrated and technological **interfaces** are required to make possible the interoperability of the existing technological infrastructure and its multiple component subsystems.

It is essential to integrate and deploy existing ICT infrastructure and **alternative technologies** for e-health services (such as ATM technologies, computer labs in schools and info-centers, smart-cards for medical records, wireless and mobile communications, etc). Shared access models located in public spaces like pharmacies, for instance, hold great potential. This is because the majority of the population only needs occasional access to improved technology-mediated health services and does not need to own sophisticated technology to derive significant benefits from it.

STANDARDIZATION, QUALITY ASSURANCE AND PRIVACY FOR A DIGITIZED HEALTH SECTOR

The area of **standards** in the healthcare sector is in constant flux and societies need to be constantly attentive to evolutions or recommendations made by the national and international standard-setting bodies and professional working groups. It is advisable to carefully evaluate existing options regarding guidelines, norms, and standards developed by the technical and scientific community before introducing new routines and procedures.

Furthermore, national authorities should develop means of assessing the **appropriateness** and **quality** of health services provided via digital networks. Outcome-based quality improvement programs will be of great importance for assuring quality and cost-effectiveness of online medical care. Evidence-based information should permit the user to follow the links between data, inferences, and conclusions. Authentication, access control, confidentiality, integrity, and reliable content attribution are key requirements for health-related advice and decision making.

The implementation of a legal and regulatory framework that facilitates medical communication at the professional level – such as interstate/province licensing and accreditation of healthcare providers— must be addressed. Consumer protection is key in e-health and **special legislation** that ensures the protection of personal health information is required.

The European and North American experience demonstrated that regulatory powers can play a significant role in encouraging the healthcare industry to comply with a variety of guidelines related to data standardization, quality assurance, security, and privacy. As in all Vertical Sectors, **incentive regulation** is the most cost-effective policy tool to assure the rapid and smooth digitization of the sector.

Source: Roberto Rodrigues

4. Digitizing culture (e-culture)

The Digital Divide has implications that go far beyond economic and material characteristics. It is a symbolic abyss in the distribution of information, citizen participation, political inclusion and representation, social services, security and prevention mechanisms, consumption of arts, cultural goods and the participation in the cultural life of a community (be this community local, national, regional or global). The right "to seek, receive and impart information and ideas through any media and regardless of frontiers" is a basic **human right**[10] and is at the service of all the other human rights. The emerging Information Society should extend and strengthen this fundamental right. In this sense, ICTs (as an enabler of information and communication) are both a right and a commodity (a "merit good" to use the terminology of welfare economics). The goal is to implement the **right for information and communication** through the global public good "access to ICT".

As always is the case in times of great structural change, there is an extraordinary demand for **civil society organizations**, which require special attention and substantial support in Latin America and the Caribbean. ICTs and digital behavior are highly important for civil society, not only due to their cost-effective and powerful coordination and organization, but also in the interest of developing and promoting social policies and to open the debate about citizens' rights to communicate and to participate. Neither access to ICTs, nor interactive software tools automatically ensure participation. Human capacity and a minimum of common virtual "habitus" are required to ensure the development of an Information Society and need to be fostered through a "**bottom-up**" approach. Discussions involving all of society need to start to address problems that arise (such as required or non-required censorship in cyberspace, etc).

Investigations should go beyond the technical dimension of ICTs and need to see ICTs for their potential of being a communication system that serves a community, a tool for social and political participation, new forms of transparency and to enrich cultural life. The final goal is to exploit the digital opportunity to create new forms of cultural, social and political participation; especially regarding traditionally excluded groups in a society, such as indigenous groups, the elderly, women and children. ICTs should not become a tool to force minority groups into the majority culture, but rather to allow them to integrate digital activities into their cultures and to celebrate cultural diversity. **Campaigns** to stimulate discussion and awareness about this dimension of the Information Society seem fundamental, especially in a region with such harsh social inequality as in Latin America and the Caribbean.

[10] Article 19, Universal Declaration of Human Rights.

5. Digitizing education (e-learning)

The educational sector presents a key policy area, not only to narrow the Digital Divide regarding "technology access", but also concerning user training and learning about the social and scientific uses of the technology. Like with most Vertical Sectors, the digitization of the educational sector has to be seen as an evolution of **existing institutions**. Educational institutions and their goals, authorities, hierarchies and power regimes, incentive mechanisms, culture and learning traditions make up part of this evolution in the educational sector. E-learning is not an "additional activity" to stand on its own separate from the normal educational curriculum, but needs to be integrated into existing reforms and modernization efforts in the different educational systems of the region.

Programs that are aimed at digitizing part of the learning mechanism need to define **precise goals**. ICTs can cover a vast range of necessities in the educational process. Nonetheless, it is fundamental to concentrate efforts on specific areas in order to prevent confusion and disorientation, which lead to decreasing motivation and fading political and financial support for such programs.

The innovation should be incremental. The introduction of ICTs into the schooling system is a slow and gradual process. It is a "next generation issue" that requires cultural change and adaptation. Therefore, e-learning programs should be institutionalized as long-term State **projects,** rather than government projects, in order to assure continuity regardless of changing governments. Developing and using quality indicators is a very efficient means of measuring progress and innovation, since advances in e-learning cannot be measured through "returns of investments".

It is also essential to institutionally exploit the worldwide flow of information, in order to better integrate Latin America and the Caribbean into the global "exchange of ideas" which takes place in digital networks. Real-time "**knowledge transfer**" through digital networks in classrooms throughout the region does not occur automatically. Up-dated information to complement curriculum and enrich class content might be largely available in cyberspace. However, the millions of WebPages around the globe tend to present an information overdose which overwhelms teachers and students alike. A virtual structure of easily identifiable and adequate quality content from all over the world (through special search-engines, etc) would be greatly beneficial.

TECHNOLOGY, TRAINING AND ADOPTION HAVE TO GO TOGETHER

Projects need to start by **raising awareness** among directors and supervisors of educational establishments because for ICTs to be used requires them to be institutionalized into the system. Next it is necessary to build out the **Infrastructure** Layer and **Generic Service** Layer accompanied by dynamic cooperation with the private sector (especially telecoms, hardware and software producers).

Lacking quantity and quality of **educational software** is still a major obstacle. Market-mechanisms do not create adequate and sufficient applications by themselves to support the learning process in the different classes and subjects. Sharing the cost of developing such educational software can only come about by reaching economies of scale. Such cooperation for creating educational software can even be established on an international scale.

The main focus of e-learning efforts however, should be the teachers themselves. In the Chilean example, a complex and well-institutionalized **human resource development** network has been established involving the Education Ministry, the private sector and especially universities and third level education institutions, which sustain and train an extensive network of “teacher-instructors” as the central axis of constant innovation.

Besides such training institutions, **incentive regimes** need to be provided for teachers to encourage them to integrate ICTs into the daily teaching methods of their curriculum. Often, they are not even paid for the time-consuming process of educating themselves about ICTs. Additionally, a lack of understanding about the potential possibilities of ICT use, fear of the unknown and the large personal effort required to re-adjust their traditional teaching approach (e.g. the loss of the teacher’s knowledge monopoly, by sharing the teaching process with interactive ICT applications), give teachers little incentive to profoundly reshape their teaching-plan by digitizing part of the curriculum. As a result, visits to the computer-lab are seen as an “extra-curricular activity”, separate from normal teaching, rather than becoming part of the core-learning. It is essential to raise awareness, share information and best-practices, and provide political and non-material incentives and even norms and certain obligations to speed up the incorporation of ICTs into the educational process.

In this respect, it is also important to point out that a major obstacle for the integration of ICT into the core-curriculum of daily teaching, is the homogeneity of the initiatives. The different contexts and peculiarities of the classes need to be considered. The teacher still needs to have the right to select its **personal pedagogic approach** and it rather needs to be aimed for reaching certain goals and milestones of e-learning, instead of pedantically dictating what and in which way computers have to be used throughout classrooms.

Source: Felipe Jara.

6. Digitizing the media (e-media)

Latin America and Caribbean countries have to be aware of the importance and potential powers of the media industry in an Information

Society. Media and entertainment companies are the driving force behind "content creation". Their economic, social, cultural and political weight in the Information Society is unpredictable. Therefore policies need to follow two paths.

The first one aims at creating an **internationally competitive information and entertainment industry**. The industrialization and professional production of "cultural goods" and content (and the eventual exportation through digital networks) is becoming an increasingly profitable business in the Information Society. Latin America and the Caribbean is very rich in culture and the common Christian and western-world roots suggest the lucrative European and North American markets as potential export destinations.

The second policy direction is aimed at **protecting the local media industry**. The media industry requires special attention, given the weight it carries in the political life of a country, its influence on domestic culture, social life and "national identity". The key question to consider here is not so much if local content providers will continue to provide local content, but rather if they will be able to remain financially independent. In the long run, the particular relationship between financial control and control over content also has to be considered. The fragmented media market in Latin America and the Caribbean is making it very easy for multinational media giants (such as AOL-Time Warner, Bertelsmann, Vivendi Universal, Walt Disney, Viacom, News Corp or Sony), to compete with or to eventually take over the different (comparatively small) Latin America and Caribbean content providers one by one. While the logical response would be to protect the domestic industry through an import-substituting legislation, the existing global information infrastructure of ICTs breaks down any attempts to do so.

An effective and market-based policy alternative would be to create scale in the regional media industry itself. By j**oining forces and creating scale by aligning with other regional media corporations and building alliances in the regional media market,** media companies would increase the region's negotiating power in the process of worldwide media concentration. It would also provide local, regional companies with sufficient economies of scale to form shared-management strategic alliances with their multinational counterparts. Such a regional alliance would help the establishment of a competitive information and entertainment export industry. However, it is important to ensure that such a regional alliance will not create a regional media monopoly itself. Sophisticated regulation and concrete cooperation between the different national governments and regulatory bodies of regional trade unions is needed to prevent the creation of a media monopoly in domestic markets.

H. Final consideration

Finally, the lack of "information" about the development of an "Information Society" in Latin America and the Caribbean is a major obstacle itself. The dynamics which exist both within and between the different Horizontal Layers, Diagonal Areas and Vertical Sectors create a fast-changing and complex scenario, which requires constant evaluation in order to ensure that Latin America and the Caribbean will find and maintain its particular "optimum transition path" towards an Information Society.

In tandem with other global, regional, national and local initiatives, this book contributes to the joint-effort of finding such a path and calls for all actors to continue their efforts in such an endeavor.

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