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Toward a Conceptual Framework and Public Policy agenda for the Information Society in Latin America and the Caribbean

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Santiago, Chile, October 2002

This document was written by Martin R. Hilbert from the Division of Production, Productivity and Management of the Economic Commission for Latin America and the Caribbean of the United Nations (ECLAC). It is part of a research project related to Information and Communication Technologies (ICT) and Information Society issues at ECLAC, carried out under the coordination and supervision of Jorge Katz, Director DDPE, ECLAC.

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The list of contributors to this book is large enough as to make it difficult to enumerate them all. The author would like to express gratitude especially to all the researchers and contributors involved in the various studies which have been carried out for the book "Building an Information Society: A perspective from Latin America and the Caribbean" (who are listed at page 35 of this document). The author is also very grateful for the countless comments and suggestions that he received during the many seminars and workshops that accompanied his work during the period of research 2000-2002. We can only hope that each one of the contributors that we could not name personally, feels at this point as if we would be personally mentioning and thanking his or her individual endeavor.

United Nations Publication
LC/L.-1801-P
ISBN:92-1-121374-6
ISSN:online version: 1680-8754
ISSN:printed version 1020-5179

Sales N° E.02.II.G.114
Printed in United Nations, Santiago, Chile

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Abstract

The advent of modern Information and Communication Technologies (ICT) and the establishment of a global "Information Society" are forcing countries of all shapes and sizes to take a fresh look on their development agendas. In order to tackle the challenging task of integrating the Information Society paradigm appropriately in to the development agenda, this paper proposes a conceptual framework to discuss and analyze the complex issues and challenges related to subject. Basing on an extensive study about the actual situation of the emerging Information Society in Latin America and the Caribbean that ECLAC carried out during 2000-2002, the second part of this paper aims at creating an adequate policy agenda, considering the various particularities that the region confronts on its path into the digital age.

I. Introduction

The concept of the "Information Society" and a "knowledge-based Digital Economy" refers to a paradigm, which is profoundly transforming the world at the beginning of this new millenium. New forms of creating and diffusing information through digital technologies mainly drive this transformation. Information flows, communication processes, and coordination mechanisms are being digitized in many different sectors of society, eventually introducing a new form of social and productive organization. This form of "digital conduct" is an increasingly global phenomenon, emerging –on the main-from mature industrial societies. The adoption of this technology-based paradigm stays in a highly positive relation with the degree of development of a society. However, technology is not only the child of development (as it stems from development), but to a large extent, it is also its father (it is a tool for development).

From the perspective of developing countries, the question of how to employ this emerging paradigm to achieve broader development goals and better integrate them into the global Information Society imposes itself on the development agenda. While Latin America and the Caribbean already came "late" to the assimilation of the "industrial age" paradigm, the role the region will play in the global Information Society and its "digital age" is still to be determined.

In order to tackle the challenging task of integrating the Information Society paradigm into the development agenda, this paper proposes to address two essential questions:

(1) What constitutes an "Information Society"?

An analytical framework must be developed in order to discuss the complex issues related to the construction and functioning of an "Information Society". Several initiatives, specialized programs and Task Forces on a local, regional and global level are trying to identify the "building blocks of an Information Society". Recognizing the efforts of many of them, the model that is presented in this paper proposes a three-dimensional conceptual framework, structured along horizontal, vertical and diagonal fields of interest.

(2) What are the adequate policies that can support the transition of a specific region towards an Information Society, considering regional particularities?

The Information Society does not build on a vacuum. The path towards the "digital age" depends heavily on the particular heritage from the "industrial age" setting. In order to understand current and potential future paths that can be taken in the transition toward an Information Society, regional peculiarities (such as the general degree of development in all its dimensions, markets, institutions, educational standards, public policies, culture, etc.) demand careful consideration. In order to obtain a clearer picture about the actual situation in Latin America and the Caribbean, ECLAC carried out an extensive study during 2000-2002[1]. Basing on the information and knowledge gathered during this process, the second part of these paper aims at creating an adequate policy agenda for the region.

[1] In June 2000 representatives of the countries of Latin America and the Caribbean gathered at the "Regional Meeting on Information Technology for development", convened by the Government of the Federal Republic of Brazil in the City of Florianopolis, in collaboration with ECLAC in its capacity as secretariat. In what has become known as the "Declaration of Florianopolis" (2000), the countries of Latin America and the Caribbean expressed their "shared aspirations to become full-fledged members of the Information Society". The declaration presents the starting point of a research project related to Information and Communication Technologies (ICT), the concepts of the Digital Economy and the Information Society, which ECLAC carried out thereafter under the coordination and supervision of JORGE KATZ, Director DDPE, ECLAC. After the completion of two preparatory studies (Hilbert, 2001a; 2001b), ECLAC invited a group of experts from the public sector, private sector and civil society in November 2001, to reflect about existing visions in the process of 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, Spain and the US and Europe, which aim at presenting a clearer and more complete picture about current developments. The final outcome (a book that covers 14 Chapters in almost 400 pages) is being prepared for publication at this moment (Aug, 2002). (see: Hilbert Martin and Jorge Katz:
"Building an Information Society: a perspective form Latin America and the Caribbean").

II. Toward a theory on the information society

All human conduct 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 non-attention transmit some kind of information. After all, in human conduct *it is impossible not to communicate* (Watzlawick and Beavin and Jackson, 1990). A constantly growing part of human communication can be and is being digitized. This process started few decades ago and is accelerating as technological solutions evolve. Such technological systems are commonly referred to as modern Information and Communication Technologies (ICT). The deployment of ICT 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 a process of 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 sets up a theoretical framework, which helps to structure and untangle the concept of the Information Society. Based on the fundamental characteristics of ICT, a way to structure digital conduct is presented. This then facilitates the identification of both the potential and limits of the technology

particularly with regard to its use for development. The rest of the book analyzes specific fields along this theoretical framework. Such an analysis will enable the proper integration of this paradigm into modern development theory and help to effectively direct policies (see the last Chapter of the book) that support the complex process of "building an Information Society".

Information and knowledge

Concepts of the Information Society (sometimes also "Knowledge Society") and the "knowledge-based Digital Economy" need to make the distinction between information and knowledge very clearly. Even though both may be interrelated, information is not equal to knowledge.

It is not possible to "transfer knowledge" over the digital infrastructure of ICT. To be precise, 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 are information converted into binary digits[2]. The process that leads from "data", to "information" to "knowledge", is a dynamic process of codification and de-codification and a process of learning.

In literature, two forms of knowledge are distinguished: **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").

Box 1
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 or custom, which is intangible and "carried inside" an individual or a community. Secondly, knowledge can also be codified in order to transmit it. A manual about how to use the machine or a textbook about how to speak a foreign language can be written down. In its natural form, knowledge is tacit and internalized so it can be used. However to transmit knowledge from one to the other, it needs to be codified, that meas it needs to be made tangible and static.

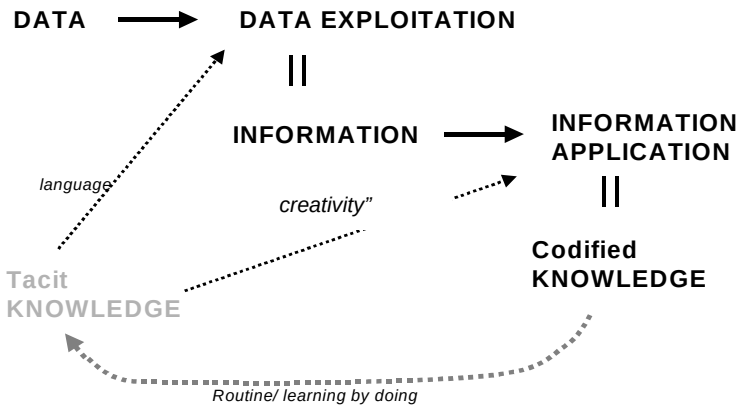
Codification of knowledge implies that knowledge is transformed into information. It is a process of reduction and conversion, whereas it is aimed at expressing knowledge in a format that is compact and standardized. There are many ways of codification. For example, smoke signals, wall-paintings in caves, writing or Morse codes are all ways of codification, the same as language itself is a very common way to codify and transmit ideas and thoughts. Codifying knowledge enables to store information or to transmit it from one to another, directly or through "information infrastructures". This infrastructure might function "manually" –like through the pony express, the 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 letteers are codified into bits through IP). Making use of previously learned --or programmed-- techniques or languages, data can be de-codified and information in return re-obtained. When receiving an email, an informatic program is decoding and organizing the data, converting them into letters. The subsequent process of "reading" would be an example, whereby a human being decodes data (letters) in order to obtain information in the form of words and sentences. Learning these languages enables the decodification of the transmitted data and their convertion into information.

[2] 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 execute instructions in bit multiples called bytes. In most computer systems, eight bits form a byte.

Box 1 (continuation)

However, the derivation of information is not equal to obtaining knowledge. Only when information is set in context, means once it can be understood, associated, and made use of, then this **creative** application of the obtained and internalized information is recognized as knowledge. By frequently consuming codified knowledge, a learning process facilitates the creation and use of tacit knowledge.



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 gets created, which then once again supports 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 characterize the "knowledge process".

While different **language** supporting technologies and programs can assist in the first step of decoding data, the second step of setting information into context, is a completely subjective one, and heavily depends on the tacit knowledge that gets applied. Spontaneous **creativity** and association mechanisms, which are based on prior training, get involved. Through 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.

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. It is an "ontology", which constitutes a set of concepts definitions that allow predictable interactions. Customs, common forms of interpretation and accepted mechanisms of understanding reduce uncertainty, minimize potential for conflicts and assure that the entire community interacts productively. It is sometimes termed "institutional-" or "organizational knowledge", or "social capital" (Cox and Putnam, 2002). Both forms of tacit knowledge (individual and community) are the outcome of a learning process (see Box "The Knowledge Process").

ICT provide great support for the codification of knowledge and the transmission and storage of codified knowledge. Through these two features, ICT has a decisive impact on the knowledge process.

First of all, there is an **increasing trend of knowledge codification and digitization**. Throughout history people have tried to store and to transmit information through many different technological systems. People have also always tried to codify as much knowledge as possible and to implement it through technological systems, in order to make it widely

available and to commercialize it[3]. Both, the embodiment of knowledge (for example through informatic applications) and the storage and transmission of information is happening through digitization in the Information Society. It is an ongoing and increasing process. In a recent study, IBM estimates that the number of "bytes" which "exist" in the world's networks and microprocessors, will increase a million-fold over the period between 2001 and 2010 (from 1 beta-byte to 1,000,000 beta-bytes) (IBM, 2001). While the methodology and the explicit numbers of this study can surely be questioned, it illustrates the explosive trend of digitization.

The second way, in which ICT has an impact on the knowledge process, is that they communicate and transfer large amounts of data with an ever-increasing reach, speed and scale. In this way, ICT can help to **accelerate the knowledge process** and therefore tacit knowledge creation. The underlying process accounts for institutional and organizational knowledge (social capital), as well as individual knowledge. The exchange of all different kinds of codified information, through the open-architectural and global channels of the network of networks in real time, affects the speed of progress and development, due to the interdependence of information-flow and knowledge creation (see Box "The Knowledge Process"). This leads to the often drawn conclusion 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.

Information and communication technologies (ICT)

Before World War II, engineering and scientific research and inventions were focused on extending man's physical powers, rather than the powers of the mind. After the war, the focus of scientific research and development turned to the "massive task of making our bewildering store of knowledge more accessible"[4] (Bush, 1945). This led to an intellectual revolution –initially concentrated in the United States-which has been inaugurated by a growing sense (firstly restricted to a segment of the scientific community), that existing paradigms had ceased to adequately meet the problems posed by an environment that they had in part created. A new paradigm emerged[5] (Kuhn, 1962). Paradigms set the basic conditions for how things are perceived. Paradigms are like wearing "red glasses". The entire world appears in red for the person who is wearing these glasses. Changes in paradigms are as if the color of these glasses is changing. The focus on knowledge and information systems and processes vis-à-vis other mechanic and motorized systems and processes, seem to be one of the major trends in scientific development in this period of paradigm shift. Based on the established paradigm of an industrial age, the new emerging paradigm 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 has numerously been argued that instruments would be at hand which-if properly developed- would

[3] 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.

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

[5] "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 exercises." (Kuhn, 1962).

give man access to and "command over the inherited knowledge of the ages" (Bush, 1945). The new paradigm has been established and it called for solid research. The stage that Kuhn –in his "Structure of Scientific Revolutions" (1962)- condescendingly calls "puzzle solving" began. Using science to work on solving this problem created new technological solutions, so-called Information and Communication Technologies (ICT). The basic characteristic of this technological system is that it brings together three different technological evolutionary paths in a process that is often referred to as "**ICT-convergence**".

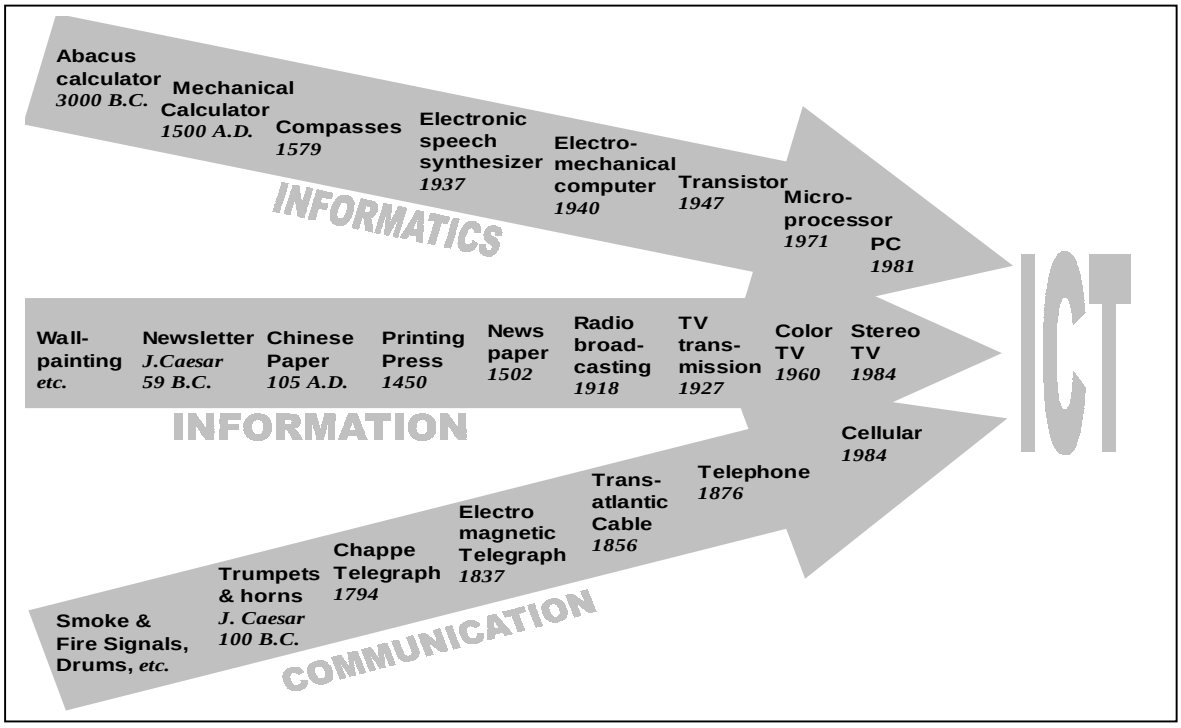
One of these three technological systems traditionally focuses on transmitting and storing **information**. The importance of information, its storage and spread has long been recognized and a broad variety of supporting technologies has had a tremendous impact on human development. For example, a very traditional and popular system to support the flow of information is books, which started with the Chinese invention of paper (usually cited 105 A.D.) and got innovated with Gutenberg's invention of the printing press6 (mid-1450s).

Second, there is the evolutionary path of systems that focus on **communication** processes. Different from the first one, communication systems are not as focused on transmitting vast amounts of information, but rather transmits small messages fast, over a large distance. Since the beginning of the 19th century, they have been increasingly characterized by adding the prefix "tele—", which is Greek for "far away" (e.g. Tele-communication). The line between information systems and communication systems might in some cases be very thin and is often even neglected in literature. There are various technical solutions, which can be used for both means, communication and information services. This comes per definition of the word "communication" and "information", since "*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 evolutionary path is **informatic service tools** and **computers**. For centuries technological solutions have been pursued which help to process information and which embody formerly tacit knowledge and skills. In the middle of the last century this evolution accelerated tremendously. Basic tools, which have been used for centuries to support "brain work" and skills (such as the abacus, the geometric triangle or compasses), have suddenly been replaced by electronic solutions that substituted their purpose. The invention of the transistor and the microprocessor enabled new dimensions of information working through informatic tools.

6 By many considered the "most important invention of the past millenium".

Figure 1
ICT-CONVERGENCE



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

The convergence of (1) informatic and computer systems, (2) content carrying information systems and (3) communication systems, is generally is referred to as Information and Communication Technologies (ICT) (sometimes also referred to 3C: Computers, Content and Communication (Tapscott, 1996)). Their usage brings about a new paradigm with regard to the way information is processed, the way communication takes place and the way knowledge is passed on.

In contrast to the example of the book and Gutenberg's printing press cited above, ICT not only enables the storage and diffusion of information, but also its exchange in "real time" (communication). A very illustrative example of this process of convergence is television. Although traditionally a tool for information dissemination (one way information flow), its convergence with the "communication evolution path", then allows data exchange in both ways by digitizing the network (digital television, ICT). Adding informatics to this process of convergence (for example translation software), now enables a person to read a book *(information)* in a foreign language *(informatics)* and to comment on it in "real time" *(communication)*, through an ICT infrastructure. The process of ICT-convergence has a tremendous impact on the nature of human conduct and on the dynamic of knowledge.

It is interesting to observe that both information supporting systems and communication systems are built on a similar architecture. First there is the (1) physical infrastructure. It serves as the "hardware" which enables to carry information (the physical paper-based book or letter, for example). Second (2) a language that enables the standardized exchange of information is required (in forms of letters or drawings or Morse-codes for example). Third (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.). Finally 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 ICT can be characterized by such four different layers (see Box "The Internet"). It consists 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). (3) "The Web", which structures communication and coordination mechanisms in some way and (4) the final content, which is the information to be transmitted.

Box 2

THE "INTERNET"

Once computers matured, it became obvious that digitizing data and storing it in its digitized form was a high potential solution for gathering and processing information. Different groups started to work on how and if knowledge –which is obviously more dynamic than data-- could be managed through a similar codification. Once codified, it could be stored, and also transmitted and interchanged, which would create such a knowledge-dynamic. The focus then shifted to finding ways of interchanging information (communication) in order to reach efficiency. The U.S. Defense Department Advanced Research Projects Agency (DARPA) supported the creation of what became known as the "Arpanet". The idea was to provide mechanisms to access as much information as possible, by connecting many different kinds of databases and computers, without having a central point of the communication system. This would also enable the system to keep on functioning if part of the network would be destroyed (as a result of war for example –a powerful argument in times of the cold war). A decentralized computer network evolved, creating an impressive dynamic through the interconnection of Information Technologies and Communication Technologies. DARPA was responsible for much of the network's growth in that period. In the early 1960s it was shown that digitizing data, and transmitting it through a packet switched system was a lot more effective than traditional systems, like end-to-end circuits (Baran, 1961, 1964; Kleinrock, 1961). Making use of this innovation, the "Arpanet" was considered the first form of what became known as the "Internet" in the 1970s and 80s (Roberts, 1967). However this network was only used by the U.S. government and some universities until 1972. In 1972 a very successful initial public demonstration of the system brought the idea of an "open-architecture network" to public awareness (in the '70s called "Internetting") (Kahn, 1972). In an "Internetworking Architecture", each network could be designed in accordance with the specific environment and user requirements of that network, and can be made to interwork with the other networks through a meta-level. There are generally neither constraints on the types of network that can be included, nor on their geographic scope. The first type of electronic mail was also introduced in 1972 and sent through this network. At this point Arpanet supported communication between 40 geographically dispersed computers. A year later the UK became part of this network as well.

Basing on these ideas the development of a new open-architecture network environment, which would eventually be called Transmission Control Protocol/Internet Protocol (TCP/IP), was governed by the idea that there would be no global control at the operations level (Cerf and Kahn, 1974). By 1990 when the Arpanet itself was finally decommissioned, TCP/IP had supplanted or marginalized most other wide-area computer network protocols worldwide, and Internet Protocol (IP) has become the bearer standard for the Global Information Infrastructure, referred to as the "network of networks", or "the Net" for short. Internet Protocol (IP) transmits single datapackets from the sender to the recipient. However, IP does not coordinate the sequence of the packets, nor does it control the eventual loss of data. TCP guarantees for those two tasks.

This system of computers and cables, which sends around small "packets" using a common language (protocol), was enhanced by a global hypertext system, generally referred to as "the Web". In order to structure this "abstract space of data" –the so-called "cyberspace"-- a browser named "World Wide Web" (www) got developed around 1990 by Tim Berners-Lee (Berners-Lee, 1990). It structures cyberspace through hypertext links. "The dream behind the Web is of a common information space in which we communicate by sharing information. Its universality is essential: the fact that a hypertext link can point to anything, be it personal, local or global, be it draft or highly polished." (Berners-Lee, 2001). Nowadays there are additional "Webs" to the www (such as "WAP" for example), but they are all based on the basic thoughts of Berners-Lee.

The often mentioned "paradigm shift", which is introduced by the usage of modern Information and Communication Technologies (ICT), is based on impacts on all four layers:

1. The infrastructure: All kind of electronic equipment gets connected to fixed, wireline, wireless or mobile networks. This equipment has an immense and ever increasing capacity of information storage. The resulting network builds on constantly increasing bandwidth, maximizing communication capacity. The decentralized network of networks reaches "worldwide" in "real time".
2. The language of information codification is modified: besides spoken and written language, digital service tools and software also enable the transmission of images, sounds, moves, entire videos, codified smells, holographs, etc.;
3. The structure of communication and coordination mechanisms—as the way information is structured, organized and handled (through dynamic, non-liner networks)—-brings about organizational changes.
4. The content transmitted: storage, diffusion and real-time exchange of information are part of many activities in a society. Therefore modern ICT can be deployed generically for many different means and in many different sectors: commerce, health, government and public administration, education, military, civil society activities, etc.

The four layers of digital conduct

As a direct result from this architecture of modern ICT, different Layers[7] can be derived, which will 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. Actors 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. In Latin America, for example, the infrastructure network with the highest diffusion is mobile telephony. At the end of 2001, the region counted 69.7 million digital cell phone subscribers[8].

The second Layer is referred to as the "**GENERIC SERVICE LAYER**". Products and services in this layer build on the Infrastructure Layer network and make it technologically feasible to create value. All kind 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. It is the facilitation of meetings and

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

[8] 2G: GSM: 4.3 million; CDMA: 17.1 million; TDMA: 48.3 million; additionally 17.6 million analogue 1G user. 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.

interactions of online activities. Horizontal and vertical portals, such as Yahoo or Google, and electronic market places, such as Ariba or Mercado Electronico are considered intermediaries.

Governmental or civil society sites and international organizations often act as intermediaries as well[9].

The forth Layer is the "**FULFILLMENT LAYER**". It makes use of digitizing 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 means, for public administration, for civil society activities, etc. In the business sector, participants of this Layer are differentiated by user segments: B2B, B2C, B2G, etc.

Figure 2
THE FOUR LAYERS OF DIGITAL CONDUCT

9 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.

While the Infrastructure and the Generic Service Layers have the characteristics of traditional production 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, products differentiation, firm behavior and forms of cooperation, hierarchical and matrix organizations, institutions, uncertainty, innovation and market equilibrium, etc.), each of the Layer of Digital Conduct is set up by rules, structures and laws, which govern the functionality of the Layer. Each Layer is searching for its own equilibrium, 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.

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 needs to be remembered that hardware production does not directly nor automatically lead to advancement towards an Information Society or a Digital Economy.[10] It is for example interesting to observe that countries with a very high production of ICT, 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 conduct (OECD, 2001).

A decisive factor in information and communication networks is so-called **network externalities** (also 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[11]. The existence of network externalities in the Infrastructure Layer distorts rational market mechanisms in other Layers. For example, they usually lead to a classic "chicken and egg" scenario between content provision and number of users in 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 is often explosively expanding into a virtuous circle of massive extension, accelerated by the powers of network externalities.

The process of **ICT-convergence** is most visible in the Infrastructure Layer. While the convergence in the Generic Service Layer is rather "invisible", the convergence of end-user equipment is far more apparent. The most plastic example may be the current mobile telephony

[10] 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.

[11] 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).

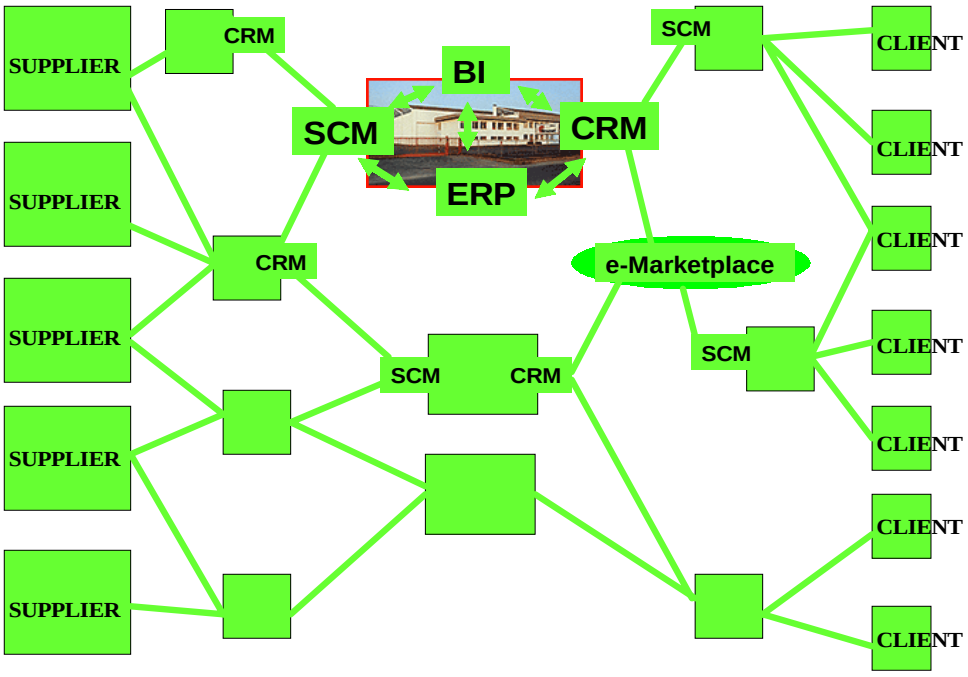
market and its fusion with PDAs and Laptops. But also the traditional television set is changing its appearance, while converging with the traditional Internet. Terminals become increasingly discriminated not by the type of service for which they are destined, but by attributes such as "portable" or "fix", of "individual" or "collective" use, with a certain level of "resolution" and "audio quality" or "memory". The forces that Schumpeter (1934) coined as "creative destruction" are very strong in the Infrastructure Layer. Some of the products become substitutes of each other, while others remain complementary. People have even tried to express the pace of the creative destruction in the Infrastructure Layer through specific "laws". The often cited "Moore's law" (the power of a microprocessor doubles every 18 month; valid since 1971) or "Cooper's law" (the efficiency of radio spectrum usage doubles every 2 ½ years; valid since 1895) give expression to the speed of innovation in the Infrastructure Layer. The rates of obsolescence and the degree of uncertainty with regard to technical progress are high in the markets of this Layer.

The **Generic Service Layer** goes 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 with a limited number of business models. The first digital service tools were designed for military use and later for economic use at the firm level.

Box 3

DIGITAL SERVICE TOOLS IN A DIGITAL ECONOMY

The first complete solutions for economic use were software programs that focused on the necessities of the production process per se, with a 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 typ were credited with important increases in administrative efficiency, these so-called MRPII were still prohibitively expensive and run on a limited set of mainframe computers only (1970s). With the advent 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 are evolving a networking business model around itself, which are based on connectedness to information and communication technologies, transforming 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 on ensuring maximum benefit of every data and information flowing 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 get 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.



SCM: Supply Chain Management; BI: Business Intelligence; ERP: Enterprise Resource Planning; CRM: Customer Relationship Management

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 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 through the Infrastructure and the Generic Service Layer, the **Intermediary and the Fulfillment Layers** evoke 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). For its part, the importance of the Intermediary Layer is growing with the complexity of interconnectivity. For an unconnected Information Technology (like an individual computer), the Intermediary Layer would 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 iterative interconnection through an intermediary[12]. In the Fulfillment Layer, communication and coordination mechanisms of human conduct –which could be of economic or social nature for example—are carried out digitally. Trading stocks online, interacting through digital TV, telemedicine 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 sector, public administration, the health sector, educational mechanisms, civil society organizations, etc.) constitute 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 analysis,** but 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.g. e-business, e-government, e-health, etc.), rather than focusing on theoretical aspects of digital intermediation and digital fulfillment. Therefore, it seems preferable to present the process of digitization along sectors that cover both, sector-specific intermediation and sector—specific fulfillment.

Digital conduct in such sectors brings special characteristics with it. In order to analyze these characteristics better, a concept of digitally –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, 2001a). Mainly driven by the low distribution costs of digital goods, the trend goes toward *digitizing everything that can possibly be digitized*. This is basically everything consisting of what is referred to 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 are the beginning. Even such an old and familiar thing as "money" has long started to enter the process of digitization (stocks and plastic money). The trend is expected to continue until every "coin" will be represented by digital data,

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

transmitted over wireless, mobile networks between portable electronic wallets in real time (e-payment).[13]

Digital goods and services have many special characteristics. Both of them 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 diffuse 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. Sticking to the example of digital music file-sharing systems, it becomes obvious that the non-rivalry of 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)[14] with regard to digital goods, has the potential to better integrate geographically disadvantaged countries[15]. However, it also is breaking down every form of informal industrial protection, which until now sheltered local industry in the developing world. Superior provider from the developed world can reach all the way until the individual doorsteps inside developing countries through digital infrastructure. This direct and worldwide competition in markets involving digital goods can bring devastating consequences for local industries, but can also open new markets for developing countries.

Summing up, the Infrastructure Layer and the Generic Service Layer lay the ground on which the process of digitization takes place. Both constitute very dynamic markets, which historically emerge from different technological systems and are therefore interwoven with the physical, technological and institutional environment in which they are established. Since the "Infrastructure Layer" and "Generic Service Layer" set the ground upon which the process of digitization takes place, they are referred to as **HORIZONTAL LAYERS**.

In turn, the Intermediary and the Fulfillment Layer represent digital activity that takes place through the Horizontal Layers. The digitization of information flows, communication processes and coordination mechanisms in different sectors of the society brings special characteristics with it (non-rivalry and death of distance of digital goods, real-time interactivity, etc.), which influences the functionality and the behavior of those sectors. Inside a specific sector, intermediary and fulfillment functions are highly interdependent and are often even integrated. Since the different sectors of society that are subject to the process of digitization build up vertically onto the horizontal groundwork, they are identified as **VERTICAL SECTORS** of an Information Society.

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13 First evidence for this is given, as in many countries payment applications through cellular telephones are already at work. By sending SMS the client can pay its Metroticket, or Sodacan with a simple 2G cell phone.

14 In 1995, The Economist published an influencing and 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…".

15 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).

ICT for development

Basing on the conceptual framework of the Horizontal Layers and the Vertical Sectors of and Information Society, two different kinds of strategies to use ICT for development can be distinguished. Some countries focus on building out a competitive industry in the fast growing ICT production sectors (**Horizontal Layers**). Emphasize is laid 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 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 had a decisive direct effect on growth in many countries (in the US: ICT production contributed 48 percent of GDP growth in 1991-95 and 56 percent in 1996-1999; Costa Rica ½ of GDP growth in 1999 stemming from ICT production (U.S. Department of Commerce, 1999, 2000)). However, as mentioned above, ICT production, especially when used for export, is not automatically implying advancement towards an Information Society or a Digital Economy. It is merely a fast growing industry.

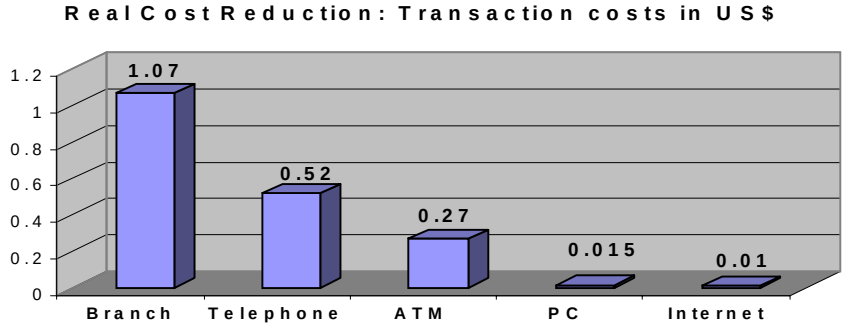
Other countries are pursuing strategies that seek to use ICT as an enabler of a wider socio-economic development process. Communication and coordination processes get digitized in order to raise productivity, mainly through efficiency gains in the **Vertical Sectors**[16]. This implies an institutional reorganization, which is advancing communication practices into a "digital age". This affects informal norms of behavior, unwritten rules and agreements, habits, customs and common forms of interpretation. A new form of institutional and social knowledge needs to find its "equilibrium" in digital conduct. At the beginning this new form of organization has a casual character, but over time it becomes habitual. Once at work, digital organization is highly effective. Digitization of communication and coordination processes can improve market mechanisms in an economy (see Box "Digitizing Market Mechanisms"), the functionality of the health sector, of educational systems or in public administration, among other Vertical Sectors.

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

Box 4

DIGITIZING MARKET MECHANISMS

By digitizing information flows and coordination mechanisms in the business sector, it is aimed for digitizing informal institutions like 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 processes. Digitizing communication and coordination processes that take place in marketplaces is a structural change in microeconomic organization, which brings several advantages with it. First of all it reduces transaction costs. Online transactions are a lot cheaper than off-line transactions.



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

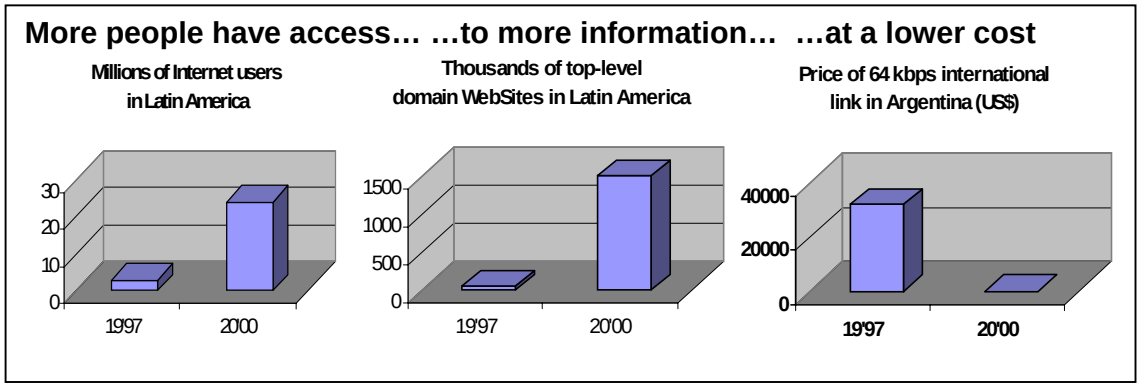
Furthermore, business coordination and communication can take place on a much larger scale, with increased speed (in "real-time") and augmented transparency and information availability. Sending an electronic "request for quotes" (RFQ) for a demanded product to a B2B marketplace, with a database of several hundred suppliers connected to it, certainly brings advantages in comparison to making hundreds of phone calls or personal consultations about the product within a limited circle of suppliers. Digital markets are an advanced form of doing business. They are widely accredited by the private sector for significantly raising productivity in their companies. Especially driven by huge and powerful transnational companies, a Digital Economy is created, which is introducing significant changes in the functionality of markets and firm behavior.

The broader concept of "development" is not restricted to economic activity alone. Sen's perspective on "development as freedom" (1999) gives expression to this. The fact that ICT and digital practices have impact far beyond the economy and can be employed in health, politics, public administration, education and advanced science, as well as for cultural, social and even religious activities, shows the potential of the current technology-based paradigm for development.

Two main lines of thoughts help to explain the impact of the ICT paradigm on development through digitization in the Vertical Sectors. The first argument is related to knowledge transfers, provoked by the augmented information flow. The second argument is related to the internal development of an individual society, due to a more valuable form of organization.

First of all, the **augmented information flow** raises hopes for a decline in information asymmetry, which is offering the historical chance of integrating all societies, by networking them in an universal Information Society (Hilbert, 2001c). More people than ever before in history, have access to an ever-increasing amount of information, at a constantly falling cost (UNDP, 2001).

Figure 3
WIDESPREAD AND CHEAP ACCESS TO INFORMATION



Source: ITU, 2000; ISC, 2001; Empirica, 2000.

The obtained information can help to create knowledge in the different sectors of a society. For developing countries this would imply that they could move closer in the direction of the current knowledge frontier in educational standards, health standards, business models, public sector administration and living standards in general. The augmented and worldwide flow of information 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. The policy advice is to accumulate more capital of all sorts in order to grow and to 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 capital accumulation is not neglected, it is increasingly accepted in development theory that different stages of development are at the end 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 thought experiment illustrates that it is individual knowledge, as well as institutional knowledge, which drives growth. If the earth were turned to the physical state that existed five thousand years ago, wiping out all structures, physical capital, and civil engineering projects, but the total of accumulated knowledge were retained, current standards of living would be recovered within few generations (Romer 1993b). Specific knowledge from the individual, as well as institutional knowledge that enable efficient coordination mechanisms, would be a basic requirement to achieve this. It is knowledge about the "way of doing things" that differentiates growth from a stationary situation. Besides the obvious lack of physical capital in developing countries, sub-developed markets are characterized by an incomplete institutional structure, which lacks this kind of knowledge.

This leads to the **second** line of thought on how ICT can be used for development. The opportunity for lagging countries is that during periods of paradigm transitions 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 with regard to their existing **institutional structure** through digitization in the Vertical Sectors.

The re-organization that results from digital conduct is introducing a new institutional setting. Institutional settings determine the form and behavior of organization, as well as the "rules

of the game". They reduce uncertainty in everyday life by forming patterns of interaction and shaping the way individuals view and understand communication mechanisms. Institutions enable effective interactivity. They are a combination of formal rules, informal norms of behavior, conventions and codes of conduct, and their enforcement characteristics (North, 1993).

An effective institutional structure is the key to growth and development. In fact, all increases in standards of living can be traced back to discoveries of more valuable arrangements for the "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[17], Paul David (1990) emphasizes that technological change make their effects felt only after they have been embodied in the institutional setting. It is claimed to take "decades" until organizations and markets are well equipped to incorporate the technological solutions productively. The focus for economic growth and development is shifting from simply connecting to the Horizontal Layers of ICT, to incorporating digital practices into the different Vertical Sectors as soon as possible.

However, formal and informal institutions are based on country and culture specific environments and are therefore characterized by certain **inertia** when subject to change. 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 Horizontal Layers (Infrastructure or Generic Services). Another is to focus on the digitization of information flows, communication processes and coordination mechanisms in the Vertical Sectors of a society. This can (a) diminish information asymmetries and support the integration into the global exchange of "ideas"; and (b) fosters the functionality of markets and institutional settings in developing countries. "Digitization" is a very powerful policy, given that inefficient institutions, lack of transparency and incomplete transactions are some of the most lamented development obstacles in many developing countries.

However in order to employ ICT and digital conduct for development, first of all a highly capital-intensive technological groundwork is necessary (Horizontal Layers) and secondly policies need to be found to accelerate the adoption of digital conduct, 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.

Conclusions

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 increasingly exchange codified knowledge, and therefore push creativity for breakthroughs in the creation of wealth and social development. The use of modern Information and Communication Technologies (ICT) and the subsequent process of digitization introduce an institutional re-organization with regard to the way information is transmitted, communication takes place and

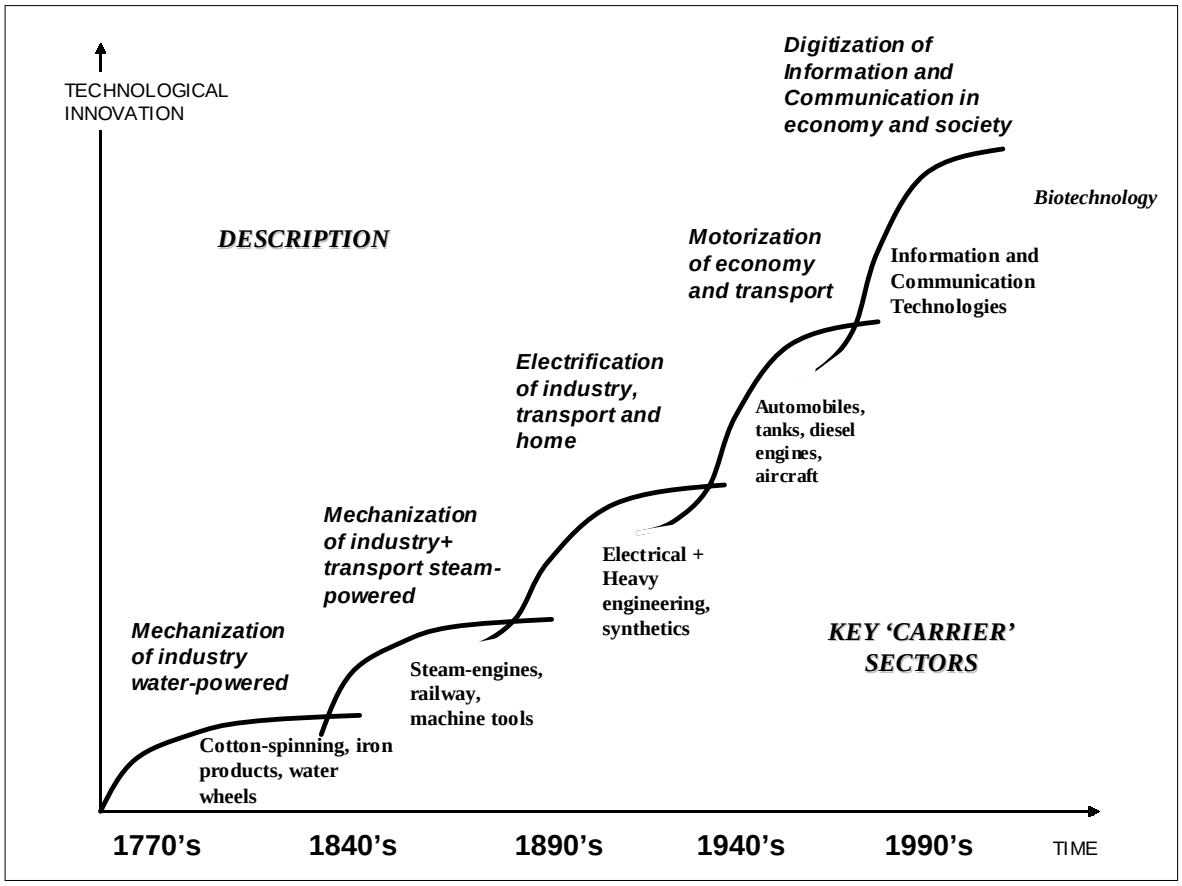
[17] The discussion about the so-called "productivity paradox" started with the observation that productivity (Labor- as well as Multifactor Productivity) mysteriously slowed down in the US economy around 1973 and has remained sluggish over the 1980s --just about the time when computers got on the scene.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

coordination is carried out. Digitizing information flows, communication processes and coordination mechanisms for a specific purpose, has far-reaching impacts on the behavior of the affected actors and the institutional structure of the specific sector.

The process of digitization constitutes what in literature about technical change is referred to as a "meta-paradigm" (Freeman and Perez, 1988), "technological paradigm" (Dosi, 1982) or "techno-economic paradigm" (Perez, 1983). According to a long tradition in economic thought (from Smith, Ricardo, Marx and later Schumpeter) the capitalist economic development is 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 forces 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). The organizational structure is constantly evolving and aims on improving performance. Undeniable social and economic transformations occur during these "long waves" (or "Kondratieffs"[18]) of technological development, shifting form one "meta paradigm" to another (Freeman and Perez, 1988). The massive usage of Information and Communication Technologies and the consequent process of digitization are the latest one (but surely not the last one) in a succession of pervasive innovations, which have shaped development over the centuries.

[18] Nikolai Dmitrijewitsch Kondratieff (1892 -1938) has pioneered the theory of "long waves" and a concluding cyclic phenomenon of long duration in economic activity. Kondratieff based his theory on the observation of trends in the fluctuation of nineteenth-century economic indicators (mainly prices). He was convinced that his studies of economic, social, and cultural life proved that a long-term order of economic behavior existed and could be used for the purpose of anticipating future economic developments.

Figure 4
LONG WAVES: TECHNOLOGY-BASED PARADIGMS



Source: Martin R. Hilbert; based on Freeman and Louça (2001)

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

Similar to other technological systems, the Infrastructure and the Generic Service Layer revolve around very capital-intensive industries. In order to foster their growth, sophisticated strategies must be found with regard to the financing and the regulation of the involved industries. Furthermore, the creation and maintenance of these industries require adequate and sufficient human capital. Such policies need to recognize existing technological systems, local particularities,

existing institutions and other special characteristics of the environment in which the Horizontal Layers of an Information Society are inserted.

The purpose of the deployment of the Horizontal Layers, is the digitization of information flows, communication processes and coordination mechanisms in different sectors of society. Almost every social and economic activity involves information and communication processes, of which many can be subject to digitization. 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 subject to digitization.[19] By taking a closer look on those different **Vertical e-Sectors** of an Information Society, it becomes obvious that all of them share similar characteristics with regard to digital conduct (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 in the health sector, or for e-government purposes. On the other hand, the existence of e-government software programs might influence the behavior of other e-sectors (e-learning, e-culture, etc.). Besides such common characteristics, 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, when –for example— business processes are taken online (e-business). Also existing health institutions and regulations (e-health), special characteristics of the educational system (e-learning) or the particularities of the local media industry (e-media) influence the process of "digitization" in the different sectors.

Finally it becomes obvious that the technological groundwork of the Horizontal Layers of an Information Society, is necessary, but not sufficient, in order to achieve the digitization of information and communications processes in the Vertical Sectors. The process of digitization represents a complex institutional change, and does not happen automatically by introducing the adequate technology. Path-dependencies and local particularities require the support of the process by different **Diagonal Areas**. Policies need to aim for overcoming the inertia of required institutional re-organization by fostering the development of the Infrastructure and Generic Service Layer, as well as to strengthen and to guide the digitization of information flows and communications processes in the Vertical Sectors of an Information Society. Such development strategies need to include all stakeholders of an Information Society (public sector, private sector and civil society) and a clear vision need to guide the particular society on its unique path into the "digital age".

In this respect it is necessary to adjust and to establish adequate **Regulatory Frameworks**. These need to ensure the development of the different Horizontal Layers through regulation of the involved industries and should enable the extension and growth of digital conduct in the Vertical Sectors, ensuring secure and confidential information exchange. Furthermore, the creation of an adequate Regulatory Framework for the Information Society implies a special focus on the provision of several basic rights (such as freedom of speech, intellectual property rights, linguistic non-discrimination, etc).

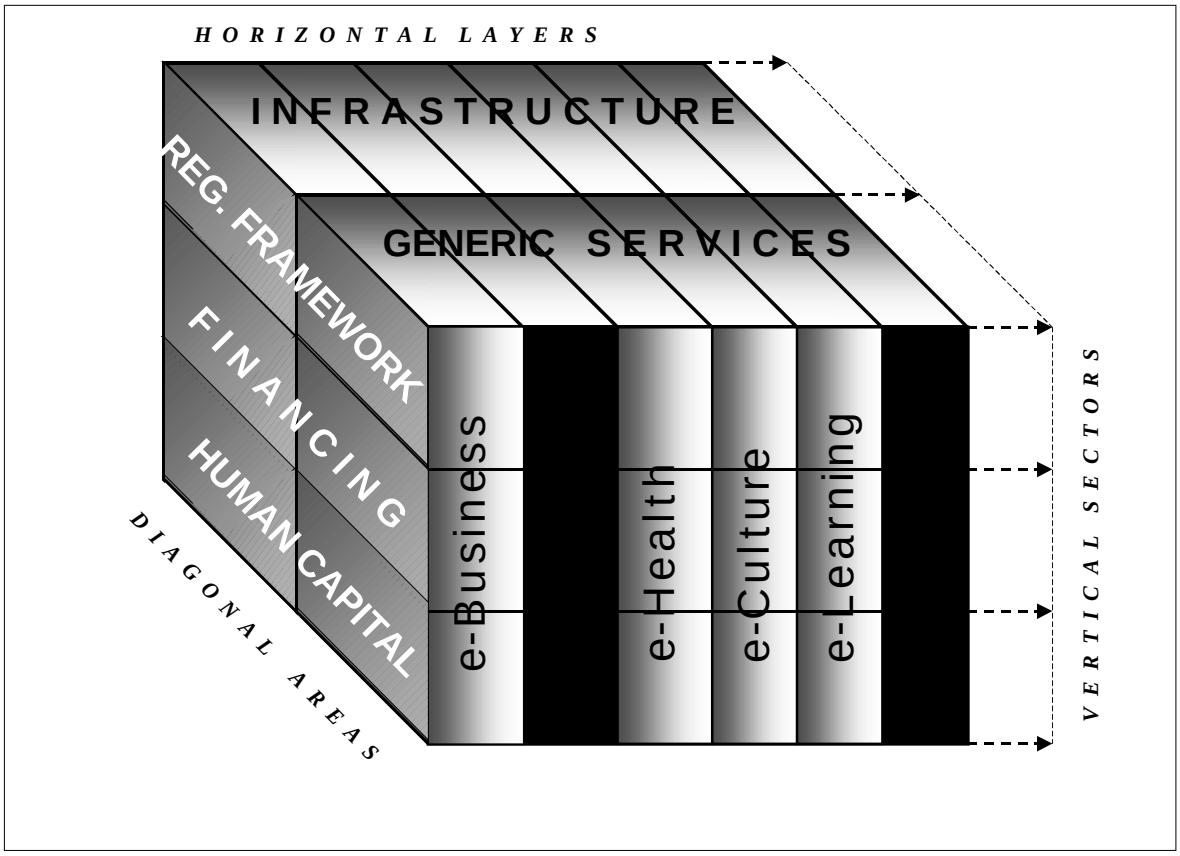
The technology and its implementation require financial capital. Resources need to be mobilized in order to enable the creation of a universal Information Society for all. **Financing** a sustainable Information Society involves the private sector and the public sector, while the private sector's focus on profit must be respected and addressed, and the public sector needs to find mechanisms to assure the inclusion of all its citizens.

[19] The list of Vertical sector might be continued, for a more detailed discussion see Introductory paragraphs of the Chapters "Vertical Sectors".

Last but not least, in order 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.

Figure 5

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



Treating these three different functional fields in one integrated approach allows identifying interdependencies, direction and causality of and between the different fields. This allows to work with it, to identify eventual bottlenecks in the different areas and to come up with adequate policy actions. It also enables to demonstrate how the different areas relate to each other.

The presented conceptual framework allows for example, to structure complex issues like the "Digital Divide", which generally speaking refers to the divide 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). It refers to access to the physical Net. However, the discussion also extents to the Generic Service Layer, since ICT-access is a combination of telecommunications—, hardware-and software performance and pricing. Inadequate software programs can be a major obstacle for ICT adaptation.

These generic issues can be felt in all of the different Vertical Sectors. The lack of affordable infrastructure or the lack of adequate software can contribute to a Digital Divide throughout all vertical areas (in the e-business sector, the e-learning sector, the e-government sector, etc.). However, the discussion can also center on the Digital Divide inside one specific Vertical Sector

(for example connectivity in small and medium sized enterprises (e-business), connectivity in schools (e-learning), in hospitals (e-health), in public administration (e-government), etc.).

Diagonal Areas on the other hand, aim for aim for overcoming the inertia of required institutional re-organization by fostering the development of the Infrastructure and Generic Service Layer, as well as to strengthen and to guide the digitization of information flows and communications processes in the Vertical Sectors of an Information Society. In order to bridge the Digital Divide, strategies involving all stakeholders of the Information Society and diagonally permeate all the different Horizontal Layers and Vertical Sectors must be developed and implemented. Such policies must embrace the establishment of an adequate Regulatory Framework needs to be created, considering requirements of every single one of the different horizontal layers and vertical sectors (for example intellectual property rights issues). However, regulatory aspects might also focus on a specific area, for instance the regulation of the "infrastructure" (e.g. telecommunications regulation, regulatory issues with regards to technical standards, etc.). On the other hand, the regulation of standard issues for example, also accounts for the "Generic Service Layer" (open vs. proprietary software, etc.). Furthermore, the Regulatory Framework touches all different vertical areas. Legislation relating to digital signatures and electronic certificate can bottleneck the development in every single vertical area. On the other hand, some special legislation might be required for particular vertical areas (for example special privacy laws in the e-health sector, etc.). The same accounts for Financing mechanisms. Resources need to be mobilized to finance both horizontal areas, in order to close the Digital Divide. Investments into infrastructure and to develop digital service tools that fit local needs are indispensable to build an Information Society. However, also the process of digitalization in the various vertical areas requires financial support (e.g. Venture Capital institutions in the e-business sector). General trade issues and economic support would embrace all horizontal and vertical areas. Last but not least, Human Capital and capacity building aspects are omnipresent and indispensable to transform into an Information Society[20]. Adequate profiles need to be found to support the built out of every single one of the horizontal as well as the different vertical areas. Complex discussions like the "brain-drain" can be structured with the help of this conceptual framework along the different fields of interest.

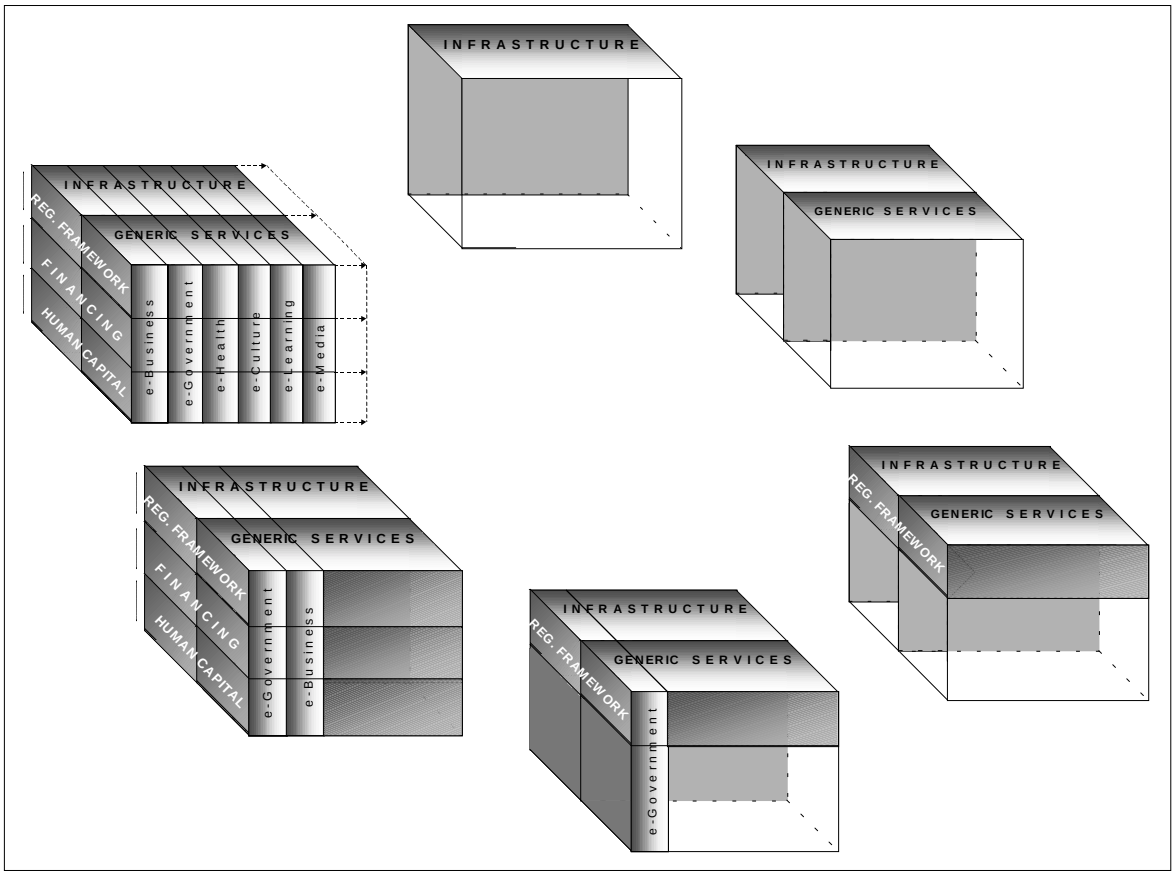
It is important to point out that the presented conceptual framework has to be understood as a "generic" model that allows us to explore different behavioral scenarios in the transition to the Information Society. The "generic" model can be used on different geographic levels (global, regional, national and local level[21]). Applying the model to a country or region specific situation requires the consideration of regional peculiarities (general degree of development, markets, institutions, public policies, customs, traditions, etc.).

[20] The diagonal issue "Human Capital" should analytically not be confused with the vertical issue "e-learning". The first issue centers in the discussion on how the workforce can be prepared to exploit the ICT-paradigm adequately. Human capital in an Information Society serves to deploy the technology correctly, 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, between these two issues exist countless spillover effects. As ICT make educational networks easier than ever it is also an adequate tool to support the capacitation of human resources.

[21] The differentiation of these levels would create a scenario of "cubes into cubes".

Figure 6

HORIZONTAL LAYERS, VERTICAL SECTORS AND DIAGONAL AREAS BUILDING UPON EACH OTHER



The dynamics that constitute the interrelationship between the different fields in the model are characterized by uncertainty, incomplete contracts, irrational behavior, spillover effects and other deficiencies and 'market failures'. An open dialogue between the different actors, institutions and organizations from all the different Horizontal Layers, Diagonal Areas and Vertical Sectors is indispensable 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 following part of the paper proposes an agenda with concrete policy actions to foster the creation of an Information Society in the region.

III. Policy Agenda for the Information Society in Latin America and the Caribbean (LAC)[22]

The advent of modern Information and Communication Technologies (ICT) and the establishment of a global "Information Society" are forcing countries of all shapes and sizes to take a fresh look on their development agendas. As a central principle of modern scientific thinking, the theory of evolution holds that it is neither the size, nor the strength and not even the intelligence of an organism that assures its prevalence in the course of evolution, but rather its flexibility –the ability to adapt to its changing environment (Dosi, et. al 1988). The changes that ICT introduce to the economy, 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

[22] The presented policy conclusions base on the findings and expertise of the different articles of the book "Building an Information Society: A perspective form Latin America and the Caribbean" (Hilbert and Katz) and a number of other studies on the subject. The author would like to thank the researchers and contributors of the various studies for their valuable input. This includes: Noah Elkin, Richard Downes, Sven Rusch and Iain Ballesty, Alejandro Arancibia, Glen Canessa, Manuel Jose Cardenas, Jacqueline Abarza, John Tonelli, Gonzalo León, Claudio Orrego, Robert Rodrigues, Marcelo Bonilla, Felipe Jara, Antonio Rosa, Tadao Takahashi, Francisco Gómez Alamillo and Ben Petrazzini.

to fall further behind-but rather to use the present structural changes as a chance to catch up. Even beyond the "Internet and high-tech crash" of 2000-2001, it becomes obvious that the Internet and the process of digitization are here to stay. They present a "meta-paradigm" which will not simply "disappear again". This makes clear that the "process of digitization" and the transition toward an Information Society should be an indispensable and urgent task on every development agenda, since the question is not about "if to digitize" or "not to digitize", but rather "when to digitize" and "how to digitize". Adequate policies, which involve all stakeholders of an Information Society, need to be put in place, aiming for a smooth and rapid transition

Following the structure of the conceptual framework presented in the first part of this paper, this section sets up a policy agenda to tackle the complex task of "Building an Information Society" in Latin America and the Caribbean (LAC).

Box 5

WHAT STEPS SHOULD BE TAKEN IN DEVELOPING COUNTRIES TO ADDRESS THE CHALLENGE OF

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 services layer:

Assure the provision of adequate software applications, 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.

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.

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.

Finanzing an information society:

Build a new international finance infrastructure to equilibrate the severe impacts of worldwide booms and crisis in the region; srengthen local investments and Venture Capital mechanisms; consider access to information through ICT a ‘public good’ and search for public finance mechanisms to deliver it.

Human capital for an information society:

Set up ICT training 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 business sector:

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 ICT an essential part of State modernization projects; Set up an inter-ministerial e-government project team, which provides 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 to treat the issue as an isolated project; Build on and integrate existent 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 ICT 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.

Box 5 (continuation)

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 ICT 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; Create scale in the regional media industry, in order to protect local content providers and to establish an iinternationally competitive information and entertainment industry in the region

Building the infrastructure layer

Policies to narrow the **Digital Divide** in the Infrastructure Layer need to aim toward an increase in investment and lowering variable and fixed-cost access prices. This can be attained in a number of different ways. Firstly, short-term initiatives and pilot projects ("micro-policies") need to aim for fast result, 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 stay in healthy competition with each other. Furthermore, the provision 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 LAC. The creation and provision of cheap and just sufficiently sophisticated access equipment needs to become an essential part of the Digital Divide agenda.

The increasing importance of **IP traffic** and missing peering agreements with North American operators lead to the fact that LAC IP network operators bear the majority of the costs of providing Internet connectivity to and from North America (which represents 60 percent of total LAC 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 to positively favor the development of the Infrastructure Layer in the region. However, the creation of a "LAC hub" would require joint forces in the domestic telecommunications sector. This also bears the risk of the creation of monopoly power in the region, which would then prevent the benefits of the hub from being passed on to consumers. An open dialogue between governments, telecommunications regulatory bodies and operators is required to work on this urgent issue[23].

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 LAC 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 has to go far beyond technical considerations. The impact on the domestic industry, the possibility of equipment production and royalties, the cost of implementation, the time to market of each system, the cost of receivers,

[23] 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 (see also Ahciet and Regulatel (2001).

forecasts regarding reductions in receiver prices and other contributing factors in favor of universal access need to be considered. A central lesson from the heterogeneous situation of analogue television in LAC is that a **common technical platform** for digital TV in LAC could support the flow of content in the region decisively.

Box 6

OPEN STANDARDS FOR DIGITAL TV

As with PCs and advanced digital cell-phones, digital TV needs to be supported by some kind of software in the "Applications Layer". It is important to assure that an **open standard** is chosen as the **API** (Application Programming Interface) for digital TV, in order not to 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 open "Internet" 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 percent of the LAC population directly, in the near future.

Another potential alternative to access the Infrastructure Layer is **mobile communications** systems. However, extending mobile data services to benefit all society in the region, will require major changes in the region's approach to the mobile industry. Overcoming the challenges of urban concentration of mobile services, providing services to low-income groups, declining market conditions, stifling tax burdens, high license fees, lack of co-ordinated spectrum (especially with regard to 3G), an uncoordinated approach with regard to standard issues and additionally preference for wire line over mobile subsidies, requires a cold appraisal of the basis of a public-private partnership that will allow mobile telephony to continue its current growth in the region.

Box 7

WORKING GROUP ON MOBILE AND WIRELESS

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, would allow administrations to take full advantage of mobile ICT's 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 use), mobile-commerce, emergency services through the mobile interface, as well as the familiar attention to international roaming and fraud.

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 applications 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 not to create closed and separate user circles. Open standards can also play an important role in the provision of adequate software systems in a local context. Innovative applications based on open source software foster the adjustment of applications to local particularities 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 services to domestic requirements.

Regarding the usage of digital services, it is recognizable that in LAC most attention is set 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.

Box 8

DIGITIZING INNER- AND INTER-ORGANIZATIONAL COMMUNICATION AND COORDINATION PROCESSES

In many developed countries, the process of digitization started "**inside the house**", before moving on to "interconnecting different actors". In LAC on the contrary, a large part of the organizational units wrote their first email before introducing their first electronic database. This accounts for firms, as well as for schools, hostipals, 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 LAC stay limited as long as the vast majority of the internal organization takes place with "paper and pen".

However, up-front costs of internal software systems are very high, their implementation requires a large effort (3-18 months projects) and provokes profound changes in social and productive organization. While the long-term productivity gains greatly exceed the required initial investment, the short-term financial and organizational requirements (such as the provision of an executing implementation team) may be too high, especially for small agents. It is necessary to provide **short-term incentive mechanisms or loans** to motivate also small organizations to make the necessary investments and organizational adjustments.[24]

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 are very restricted. The business model of **Application Service Provision (ASP)** reduces the cost of such applications.

Box 9

REDUCING COSTS AND IMPROVING QUALITY THROUGH APPLICATION SERVICE PROVIDER

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 of the service provider guarantee the client the functionality of the system and provide a constant up-date of applications in an industry where performance outdates 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 LAC. The creation and establishment of the industry deserves special attention.

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 societies.

[24] These incentives need to consider the full cost of the implementation of application systems (hardware, telecom, software, implementation services, capacitation and training, reorganization, etc.).

To prevent this from happening strong and visionary leadership is required, reducing coordination costs and uncertainty.

In **international initiatives**, "meaningful participation" (UN ICT Task Force, 2002)[25] of developing countries has to be assured, and from its side, LAC needs to assure to get involved, to contribute and to benefit 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 form the industrial age' provides different starting points, in different regions and countries. In order to assure the incorporation and full exploitation of the existing assets, it is paramount to induce the participation of all stakeholders of an Information Society in such an initiative.

On the regional level, the countries in LAC are in the process of setting up "LACNET", the Latin American and Caribbean Regional Network of the UN ICT Task Force (www.unicttaskforce.org)[26]. The active participation of the countries in this initiative will be essential for the success of this regional strategy tool.

On a national level, it is essential that 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, the 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, whereas 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 path 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 the 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 form 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[27].

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25 United Nations Information and Communication Technologies Task Force; Working Group 1; http://www.unicttaskforce.org/groups/members/public.asp?cod_tema_menu=30

26 United Nations Information and Communication Technologies Task Force; Regional Networks; http://www.unicttaskforce.org/regional/principal.asp

27 The presented best practice from Belgium, with regards to the creation of an early warning virus alert network, showed how great advances can be achieved with little financial input, through joint coordination between the different stakeholders of an Information Society.

Regulatory frameworks for an information society

The regulatory challenge with regard to 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 to assure 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, an intellectual property rights regime is needed, which recognizes 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. In contrary to many developed countries, the majority of LAC telecommunication industries have been privatized at a moment 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. To find an adequate and sustainable level of competitiveness (workable competition) to allow the operators –on the one hand—- to extract enough rent to justify further investments in the network build-out and on the other hand to seek low prices and high service quality, constitutes one of the most difficult tasks in telecommunications regulation in LAC –and elsewhere in the world.

Box 10

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 LAC 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.

The omnipresent significance and the potential strategic power of **technical standards** are often underestimated in technological development strategies in LAC. The neglect of the issue and the uncoordinated search for foreign investments created a uniquely challenging standard scenario in LAC, which can 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, with regard 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 their eventual convergence). Brazil's extensive process 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 mechanism, and the high costs of such tests could be shared on a regional scale. Secondly, in 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 analyzes is indispensable to decide 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 LAC countries and companies to **participate in standard consortiums** worldwide. Many of those consortiums are open for participation. This would assure that the special characteristics of the region are considered when a new standard is created, and

furthermore, through the close cooperation with countries and companies on the technological frontier in such consortiums, LAC could convert from being a "standard taker" into becoming a "standard maker".

Furthermore the adjustment of the **juridical framework** is key. In theory, the less rigid regulatory environment in LAC (in comparison to stiff regulatory environments in some developed countries) should provide the region with the chance to move a lot faster in **adjusting** their **regulatory framework** to the needs of the digital age. In practice however, the low priority given to the issue results in missing or inadequate legislation in LAC 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.

Box 11

ENABLING DIGITAL TRANSACTION ACROSS THE REGION

Digital transactions are often cross-country 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 LAC, 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) which 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 a level of the existent integration process (especially Andean Community and MERCOSUR). The directives and recommendations of the European Union could serve as a raw model on such a level (especially with regard to the definition of the juridical 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 norms for e-payment to provide security and a climate of confidence in e-practices).

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 form research and development (R&D) expenditure and the social demand that innovators should not overexploit dominant market positions from their patent holding. Such a regime also has to recognize the special characteristics for 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 LAC should not underestimate the importance of Internet governance and domain name system management.

Financing an Information Society

The necessary resources that have to be mobilized in order to finance the establishment of an Information Society in LAC require the joint effort of the private and the public sector.

Box 12
FINANCING IN A TIME OF CRISIS

LAC is very sensible and vulnerable to worldwide economic trends. A worldwide economic downturn has been shown to have disastrous and multiplied effects on regional finance mechanisms. After worldwide high-tech stock markets crashed in 2000, the formerly extraordinarily high Venture Capital flow into LAC stopped completely. Also, foreign investment flows towards the region diminished decisively in the early 2000s. However, foreign direct investment and venture capital continue to be indispensable to finance 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 te Infrastructure Layer, the same as financing mechanisms to assure capital for the Applications 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 investments in the years to come for LAC. 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 equilibrate the severe impacts of worldwide booms and crises in LAC (Ocampo, 2001)[28] 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 LAC, should be part of this global program.

In the short run, 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 from other countries (especially from Israel[29]) show that governments themselves can act as a catalyst for emerging Venture Capital markets. The deployment of ICT and digital networks itself, can be used to assure a better, **more transparent and more flexible resource allocation** in capital markets of all shapes and sizes in LAC. 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 and corporate governance **regulations need to be set in place**. Courts have not been protective of these rights, because of the lack of a well-defined body of law in this respect. Effective financing mechanisms also relate to business culture, as for example many LAC companies are family-run businesses and their owners have traditionally been insensitive to the needs of minority shareholders.

Considering historical evidence from the diffusion process of TV and radio receivers, there seems to be little economic reason why the Digital Divide should be closed in the near future, if the transition towards an Information Society is to be solely guided by market mechanisms. In order to accelerate the process of ICT diffusion, the **public sector** in low-come countries will have to find creative ways how the limited resources available can be efficiently used to provide a **minimum level of ICT access** to the entire society. Policies with regard to the formation of **public goods**,

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28 Ocampo, José Antonio (2001); "Growth with stability. Financing for development in the new international context"; ECLAC, Economic Commission for Latin America and the Caribbean; http://www.eclac.cl/cgibin/getProd.asp?xml=/publicaciones/xml/1/9431/P9431.xml&xsl=/tpl-i/p9f.xsl.

29 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 VC and high-tech industry.

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 aims for accelerating the adoption of the new paradigm, require detailed evaluation and visionary actions from the public sector. The risk is too high, to create another form of inequality and exclusion when leaving development completely to market mechanisms.

Human capital for an information society

Two policy directions have to be considered for the challenging task of creating "human capital" at the service of an Information Society.

The first one centers on **training issues**. Analysis from the Vertical Sectors showed clearly that the usage of ICT and the adaptation of digital practices requires 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 for the ever-changing e-environment. Investments into training aspects need to be considered by public incentive mechanism policies, which foster the adoption of digital practices, for example through tax-incentives for the institutionalization of ICT training[30].

Box 13
USING ICT REQUIRES TRAINING

Training of human resources and awareness programs for staff members proves to be important in e-sectors, since opposition to change from professionals is frequently a major obstacle to deployment. 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 functions and training needs in the specific Vertical Sectors and Horizontal Layers (e.g. in the health, the governmental and business sector; or telecommunications and software). Training programs need to be developed to meet the identified needs of a target group. The establishment of a network of training focal points seems useful, taking into account the specific organization and circumstances of local characteristics.

A dynamic and proactive **cooperation within the academic sector** (especially integrating universities) proves highly effective. The creation of a university network for technical assistance and for education purposes (for example to capacitate high-school teachers, physicians, entrepreneurs of micro-enterprises and SMEs, etc.) is a very cost-effective solution. The institutionalization of such a network requires a stable coordination. Especially the introduction of a "hierarchy" in the capacitation network (whereas educators capacitate educators in an ongoing chain) proves efficient.

It can be made use of **e-learning** to facilitate the required training process. For example distance education, virtual consultant portals or educational and informative Intranets for health professionals, micro-enterprise- and SME entrepreneurs, teachers or public sector authorities are cost-effective solutions to reach a broad audience. Such virtual information and education mechanisms should not only be deployed for professionals but also for consumer education.

The second policy direction in the Diagonal Area of Human Capital aims at the creation of "tacit knowledge", in order to gain a competitive advantage in a society where information is widely available through digital networks. This involves the notorious "**brain drain**". While

[30] 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.

workforce mobility cannot be prohibited in an increasingly globalize 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 losing them, requires a change in business culture. This presents a major challenge for LAC, where the hierarchical organization of many (family-run) enterprises rather bears the potential to motivate young professionals to leave their home country.

Box 14

THE INFORMATION SOCIETY COMPETES THROUGH TACIT KNOWLEDGE

Also existing education mechanisms require more attention in LAC. The public sector responsibility to provide adequate basic education to all society, gains weight in an economy that competes for tacit knowledge. Public-private sector collaboration in tertiary education is indispensable in order to provide updated content to an affordable price. Experience shows that the interest of the private sector in a well-equipped local workforce can even be used to finance part of the expensive tertiary education. Creative ways have to be found to incorporate the industry, while preventing the capacitation of individual "firm experts" in universities. However, even the creation of "firm experts" (especially through postgraduate studies) does not go against the goal of creating high quality human capital. Funding should be competitive.

Public-private sector partnerships are also necessary to create "life-long-learning" mechanisms, which implies the extension of national education systems to the existent 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 old can profit from it, but also the 25-60 year old. Involving the private sector in this effort, could lead to subsidies and tax allowances for individuals and firms to invest in skills. Such a policy would also reduce the risk of out-dated curricula.

Since curriculums and study programs become obsolete very fast, the identification of **professional profiles**, which fit the special requirements of the particular industries in LAC, imply a shared responsibility between education institutions, the public sector and the industry itself. The creation of a network of representatives from all the different players involved, which acts, as an observatory to monitor and propose adequate professional profiles, becomes indispensable to avoid the common "skill-mismatch".[31] Taking into consideration the often very similar characteristics. and requirements in LAC industries, such an observatory could even work on a supranational scale, in order to make use of synergies.

In many LAC countries special agencies exist, which support the training of the national workforce. Over the decades these "**national apprenticeship agencies**" became powerful and recognized organizations and manage a considerable annual budget. However, being relicts of the time of import substitution, they are ill equipped to meet the demanding challenges of a workforce in the Information Society and would need profound overhauling. These agencies would also be the right place to start initiatives with regard to private-public sector partnerships and the identification of adequate professional profiles. Putting these agencies fully into service of creating a well-equipped workforce for the Information Society in LAC would be a powerful policy.

Digitizing the business sector (e-Business)

A large amount of **scientific research** is necessary to untangle and help to understand the functionality of the Digital Economy in LAC. Research centers and academic investigations are in high demand to analyze what can, and what cannot be done over digital networks in LAC, to

[31] The presented project "Career-Space" shows an alternative through which a public-private sector partnership can help to identify adequate and demanded professional profiles.

identify bottlenecks and to underline best practices, considering the special characteristics of the region. It is indispensable to create research networks between the public sector, private businesses and the academia to accomplish this urgent task and to foster the understanding of digitizing business processes in LAC.

The main focus of e-commerce in LAC is set 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 in order to develop B2C commerce, since B2C "up-front" retailing often entails solid B2B "back-stage" mechanisms. In this respect, the focus needs to shift from seeing the Internet as a "new sales channel" and it needs to be focused on the digitization of the entire business and commerce process, by integrating digitized inner-firm processes into an outer-firm network. At the same time, however, the region must remain cognizant of the structural changes that labor-saving technologies present in a region where low-cost, low-skill manual labor is a central facet of the economy and where high levels of un- or underemployment have historically prevailed.

Box 15

SPECIAL FOCUS ON SMES

There is a clear positive relation between the size of the firm and 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 is underlining the benefits and the potential of the "quick follower". The structural importance of micro-enterprises and SMEs in LAC economies and the high potential benefits form putting their business practices online, points to an area worthy of attention for governments, public-private partnerships and multi-lateral lending agencies1. 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 LAC is essential to become competitive in what is an increasingly globalized Digital Economy.

A multitude of standards in different online trading platforms (especially technical standards and standards with regard to product definitions), present a major obstacle for micro-enterprises and SMEs to get fully integrated into local and international digital supply chains. Technical assistance is necessary, and at the medium-term a national strategy needs to be found to deal with the issue.

Security concerns are especially large with SME e-commerce providers. It is fundamental to promote the diffusion of 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.

The Brazilian experience shows that the **banking sector** can play a central role in the development of e-commerce, especially online transactions. Payment systems remain 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 applications prove very beneficial for the progress of overall online activity. Brazil's e-commerce pre—eminence in the region is to a large part due to the country's advanced e-banking sector. The special characteristics of LAC 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 exploited.

Digitizing government (e-Government)

The digitization of public services holds great promises for performance quality and cost-effectiveness of public administration in LAC. It can also support the massification of the Internet, as experience form Chile, Brazil and Mexico shows that "killer-applications" like online tax paying or B2G portals, are decisive motivators for companies in their decision to go online. In the long run, e-Government can contribute significantly to citizen participation in a democracy. For now, digital organization in public administration can increase transparency and support anti-corruption initiatives, a long-standing concern in the region, and elsewhere in the world. It needs to be assured that e-government initiatives become an integrated part of **existent state modernization reforms** and not to be treated as a separate project. It is important to prevent the discussion from becoming a debate about technology and computation, but rather a reflection about public administration and governance. The entire spectrum of public sector activity needs to be incorporated in the effort of digitization (including traffic regulation, police, fire departments, natural disaster prevention, etc.).

Generally speaking, e-government projects undergo **five stages**, which start with the (1) digitization of administrative processes inside the public sector, continues with (2) an increasing Web presence, (3) an increasingly interactive online dialogue with the citizens, (4) online transactions and (5) eventually the integration of the e-government front-end interface.

Box 16

PARTICIPATIVE LEADERSHIP FOR A NEW FORM OF GOVERNMENT

To realize an e-government project, realistic objectives, strategic planning and strong leadership are indispensable. E-government initiatives can greatly benefit from experiences from other countries and from experiences of the private sector. Cooperation with the private sector (especially in the technological field) is necessary, but not sufficient. The government has to become a leader in ICT adoption itself. The internal resistance to such kinds of reforms should not be underestimated. To overcome it leadership from the highest level of the public sector is required. However, an e-government project team needs to incorporate all different stakeholders of 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 demand of the citizens. Ahciet's initiative "digital cities", which gathers almost two hundred municipalities from Iberoamerica, presents a best practice with respect to assure participation and cooperation between all stakeholders of an e-government in LAC (www.iberomunicipios.org).

Digitizing the health sector (e-Health)

The deployment of ICT to improve performance in the health sector is widely neglected in LAC and the concept of e-health is not adequately embraced and often misinterpreted. E-health goes far beyond telemedicine and distance consultations. Similarly to what has been pointed out in regard to B2B and B2C e-commerce, the "business-to-consumer" interaction of telemedicine is only a small part of e-health. The greatest challenges in the implementation of ICT in health and healthcare are related to digitizing "back-office" processes, automating intra- and interorganizational health structures and creating digital networks **inside** and **between** the different units of the national health sector.

In the light of current modernization and health reforms in the LAC, 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 to each healthcare model organizational goals and priorities and must deploy a technological architecture and infrastructure best suited to enhance

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 LAC is a largely decentralized industry populated by diverse organizations with overlapping responsibilities and diverse and many times 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 in order to exchange experience and knowledge to facilitate implementation. The participation of the private sector through cooperative partnerships, especially with the informatics industry, is indispensable. **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 ICT.

In the past decades, a great variety of information systems have been implemented in LAC health and healthcare organizations. In order to enhance 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 **existent** 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 for instance in pharmacies, hold great potential, since for the end-user the most significant benefits lies in the temporary access to technology-mediated improved health services and not in the continuous ownership of sophisticated technology.

Box 17

STANDARDIZATION, QUALITY ASSURANCE AND PRIVACY FOR A DIGITIZED HEALTH SECTOR

The area of standards in the healthcare sector is in constant flux and one must be attentive to the evolution of the recommendations arising from 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 for assessing the appropriateness and quality of health services provided via digital networks. Outcome-based quality improvement programs will be of great importance in 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 licensure 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 coaching the healthcare industry into complying 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.

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 at large (be this community local, national, regional or global).

Like always in times of great structural change, **civil society organizations** are in extraordinary demand and require special attention and substantial support in LAC. ICT and digital conduct is of high importance for civil society, not only for 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 ICT, nor interactive applications do automatically ensure participation. Human capacity and a minimum of common virtual habit are required and need to be fostered through a "**bottom-up**" approach. Discussions about arising problems (such as required or non-required censorship in cyberspace, etc) have to be stimulated and need to involve all society.

Investigations should go beyond the technical dimension of ICT and need to capture ICT in its potential for being a communication system at the service of a community, a tool to create social and political participation, new forms of transparency and to enhance cultural life. The final goal is to exploit the digital opportunity to create a new forms of cultural, social and political participation, especially regarding traditionally excluded groups in a society, such as indigenous groups, old people, women and children. ICT should not become a tool to force minority groups into the majority culture, but rather to allow them to integrate digital conduct into their cultures and to support variety. **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 LAC.

Digitizing education (e-Learning)

Like with most Vertical Sectors, the digitization of the educational sector has to be seen as an evolution of **existing institutions**. Schools and their goals, authority, hierarchy and power regimes, incentive mechanisms, culture and learning traditions make up part of this evolution in the educational sector. E-learning is not a stand alone "additional activity", but needs to be integrated into existent reforms and modernization efforts in the different educational systems of the region.

Programs that aim for digitizing part of the learning mechanism need to define **precise goals**. ICT permit to cover a vast range of necessities in the educational process. 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.

The innovation should be incremental. The introduction of ICT in the scholar system is a slow process. It is a "next generation issue", linked to cultural change. Therefore, e-learning programs should be institutionalized as long-term **projects of the State**, rather than a government, in order to assure the stability and continuity of the effort. The development and usage of quality indicators, to measure progress and innovation, is very efficient, since advances in e-learning cannot be measured through "returns of investments".

Box 18

TECHNOLOGY, TRAINING AND ADOPTION HAVE TO GO TOGETHER

Projects need to start with awareness raising between directors and supervisors of the establishments. This is necessary since the usage of ICT needs to be institutionalized in the system. Then building out the Infrastructure Layer and Applications Layer is key. A dynamic cooperation with the private sector (especially telecomm, hardware and software producers) proves valid.

Quantitative and qualitative insufficiencies in educational software present a major obstacle. Market-mechanisms by themselves do not create adequate and sufficient applications to support the learning process in the different classes that are foreseen by the curriculum. Economies of scale need to be reached to share the cost of developing educational software. Such collaboration can even be established on an international scale.

The main subject to change however, is the teacher and educator. In the presented example from Chile, a complex and well-institutionalized human resource development network has been established, involving the Ministry, the private sector and especially universities and advanced academia, which sustains an extensive network of "teacher-instructors" as the central axis of constant innovation.

Besides such training institutions, incentive regimes need to be provided for the teacher, to integrate ICT into the daily practices of its curriculum. Often, the time-consuming process of educating him/herself about ICT is not even remunerated. Additionally, missing understanding about the potential possibilities, fear of the unknown and large personal efforts to re-adjust the habitual pedagogic approach (e.g. the loss of the teacher's knowledge monopoly, by sharing the teaching process with interactive ICT applications), give little incentive for the teacher to profoundly reshape its teaching-plan, by digitizing part of its curriculum. As a result, visits to the computer-lab are seen as an additional "on-top" activity, rather than becoming part of the core-apprenticeship. Awareness raising, information and best-practice sharing, political and immaterial incentives and even norms and certain obligations to speed up the incorporations of ICT into the educational processes, become necessary.

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.

It is also essential to institutionalize the exploitation of the worldwide flow of information, in order to integrate LAC better into the global "exchange of ideas" which takes place in digital networks. Real-time "**knowledge transfer**" through digital networks into the classrooms of LAC does not occur automatically. Up-dated information to feed curriculums and enrich classes might be largely available in cyberspace. However, the millions of WebPages around the globe rather present an information overflow, overwhelming 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 of great importance.

Digitizing the media (e-Media)

LAC countries have to be aware of the signification and the potential powers of the media industry in an Information Society. Media and entertainment companies are the driving force in "content creation". Their economic-, social-, cultural and political weight in the Information Society is unpredictable. Policy directions are twofold.

The first one aims at the creation of an **internationally competitive information and entertainment industry**. The industrialization and the professional production of "cultural goods"

and content (and the eventual export through digital networks) is an increasingly profitable business in the Information Society. LAC 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 aims for the **protection of the local media industry**. The media industry requires special attention, given its weight 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 provider will continue to provide local content, but rather if they will be able to stay independent financially. In the long run, also the particular relation between financial control and control over content has to be considered. The segmented media market in LAC is making it very easy for transnational 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) LAC content providers one by one. While the logical response would be to call for protective legislation, the existing global information infrastructure breaks down any eventual and existent attempt to protect the domestic industry through an import-substituting legislation.

An effective and market-based policy alternative would be to **create scale in the regional media industry itself**. This would increase the regional negotiating power in the process of worldwide media concentration, and would provide domestic companies with sufficient economies of scale to enter sincere and stable strategic alliances with their transnational counterparts. Such a regional alliance would also favor the establishment of a competitive information and entertainment export industry. However, it needs to be assured 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 can provide for this assurance.

Final consideration

Finally, the lack of "information" about the development of an "Information Society" in LAC 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 assure that Latin America and the Caribbean will find and maintain its particular "optimum transition path" towards an Information Society.

In close alignment with other global, regional, national and local initiatives, this publication contributes to the joint-effort of finding such a path and calls for the continuation of such endeavor.

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