RICYT Iberoamerican Network on Science and Technology Idicators	Ministério da Educação Republic of Portugal	OEI CAEU CAEU Observatory – Organisation of Ibero-American States	aecid Spanish Agency of International Cooperation for Development

Lisbon Manual

Guidelines for the Interpretation of Available Statistical Data and the Construction of Indicators for Ibero-America's Transition to the Information Society

2009

Preface

This document is the product of the activities carried out by RICYT (Network on Science and Technology Indicators), in cooperation with the Science, Technology and Society Observatory of the Centre for High Studies (*Centro de Altos Estudios Universitarios (OEI*)) and the Ministry of Education of Portugal. The activities carried out by the sub-network included various Workshops on Information Society Indicators that served as basis for the drafting of the 2006 Lisbon Manual, and the review presented today, under the same heading as its first version: "Lisbon Manual, Guidelines for interpretation of available statistical data and construction of indicators for Ibero-America's transition to the Information Society".

During the 4th Ibero-American Seminar on Knowledge Society Indicators (*IV Seminario Iberoamericano de Indicadores de la Sociedad del Conocimiento*), held in the city of Lisbon, Portugal, in September 2008, a presentation was made on the progress made for each chapter and the new dimensions to be incorporated to the Manual were discussed. Most of them are included in this new version; others were agreed upon as future network working lines.

This new version has been enriched with specific contributions during the preliminary activities for the IV Seminar and discussed during its development. The purpose of this practice is to guarantee that the document comprehensively reflects the diversity of approaches so that a widely supported consensus may be reached.

The 2009 Lisbon Manual, now at dissemination and discussion stage, is expected to be enriched through the participation of the members and to contribute to a better interpretation of agreed-upon indicators –and consensus plan- and statistical information, as accepted by the various regional, national and international organisations. Therefore, the Manual is expected to contribute to the overall analysis of the Knowledge Society and, hence, it is presented as a tool for studying, interpreting and analyzing built indicators and not as a technical and prescriptive document.

Furthermore, note that this document is the product of the joint efforts of several institutions and, pursuant to the spirit of RICYT, the active participation of information generation institutions, experts and analysts of the Information Society and the actors in charge of designing and implementing public policies is expected to contribute to the enrichment and improvement of the analysis presented herein.

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GEPE - ME

This document was drafted on the basis of a work coordinated by Gustavo Lugones, Diana Suárez and Nuno de Almeida Alves, who relied on the invaluable academic and organisational participation of Roberto Carneiro, Rosa Porcaro, Carlos Angulo, Salvador Estrada, Ester Schiavo, Fernando Peirano, Claudio Alfaraz and Nuno Rodrígues. We also appreciate the cooperation of ISCTE and CIES and, particularly, António Firmino da Costa, President of the Scientific Committee of CIES, for his support and assistance during the 2001-2008 Lisbon Workshop series.

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Chapter 1: Measuring the development of the Knowledge and Information Society

a. Purpose of the Second Edition

Since the publication of the 1st edition of the "*Lisbon Manual. Guidelines for the interpretation of available statistical data and the construction of indicators for Ibero-America's transition towards the Information Society*" in 2006, progress has been made regarding the Knowledge and Information Society, transforming and being transformed by the society in which it exists. The lapse of time has allowed for the consolidation of certain technologies, the obsolescence of others and, particularly, the introduction of new tools. Thus, the dynamism of the element studied calls for reviews and updates, not to correct mistakes or modify approaches, but due to the fact that the transition to the Knowledge Society is a process defined by change, by constant mutation of technologies and the relation to users. That is precisely the purpose of this new edition of the Lisbon Manual; i.e. monitoring change, evolution and transition.

Pursuant to the arguments of Angulo Martín and González Hortelano (2008),[1] "the characteristics that define the Information Society can be summarised by dividing them into three large categories. On the one hand, it involves a continuously changing sector, considering the difficulties that this entails both for definition and measurement thereof. Secondly, this field has huge potential and possible applications have not been entirely defined yet. Lastly, as regards the aspects above, we are facing a process that is open to technological innovations which, in turn, will modify the definition of the sector and will focus on new applications. Moreover, this technological process is developing at high speed resulting in that an innovation becomes obsolete within a very short period of time".

As regards the construction of indicators, even though during the last few years progress has been made in relation to consensus as to the relevance of measuring the transition to the Knowledge and Information Society (KS) in its different dimensions: businesses, households, government, citizens, etc., progress was not significant as regards the effective construction of indicators suitable to monitor such process.

While in some regions —particularly European Union countries— there are already time series for basic IS indicators, in others –basically Latin American- there is considerable imbalance as to the information available. In this sense, while in developed countries the discussions regarding KS indicators seem to focus on the need to account for the impact and penetration of information and communication technologies (ICTs), in some countries with less relative development it is not yet possible to know exactly the degree of penetration of less complex and more widespread technologies such as mobile phones or the Internet.

The lack of statistical information has then become an obstacle to the development of instruments capable of driving greater complexity in the incorporation and use of new communication and information technologies. This explains the fact that the effort made for the development of measuring instruments is consistent with the implementation of public policies. In other words, while for developed countries indicators constitute monitoring instruments, for developing countries, these indicators represent inputs and policy assessment mechanisms (more consolidated in some countries than others).

[1] Angulo Martín, C. and González Hortelano, A. (2008): "*Propuesta de incorporación de indicadores TIC en los hogares de América Latina al conjunto de indicadores de CyT de RICyT*" Contribution to the Chapter on Households presented at the 4th Workshop on Knowledge Society Indicators, Lisbon 2008.

In this sense, the purpose of this document is to present the progress made by key international organisations as regards methodology, indicators and consensus regarding the measurement of the transition to the KS. Hence, we expect to contribute to the development of an analysis framework suitable to maximise the usefulness of available indicators and those yet to be built. Moreover, the aim is at identifying the spaces not yet covered by existing —or agreed-upon— indicators to contribute to an improved application of statistical information on those countries that have vast experience in measuring the aspects at stake, thus allowing progress to more complex measuring levels.

Similarly to the 1st edition, the proposal described below is aimed at contributing to the drafting of a Procedures Manual or Guide to comprehensively discuss the matters related to the measuring of the IS. However, as opposed to the 1st edition, the progress made in the measuring and dissemination of indicators allows to go further, beyond the issues of what, who and how to measure.

Even though methodological (what and how to measure) and institutional (who measures and what is used to measure) aspects play a key role in this document, the availability of information and the development of diverse research and analysis has led to progress on the different theoretical-methodological approaches that allow for a more complete characterisation of the process. In this sense, this edition resumes prior works in order to submit aggregate information that, undoubtedly, will later constitute one of the multiple possible approaches to face the transition to the KS.

Lastly, pursuant to the spirit of the Manual, it is necessary to emphasise that this document is intended to serve as a tool for analysing different existing measurements and methodologies. In this respect, its main aim is to provide the users of statistical data with a better understanding of available information by combining and supplementing the diverse progress made in measuring the so-called Information Society.

b. Background of the Proposal

The Lisbon Manual is basically the product of the work of all those who compose RICyT in the context of the sub-network of indicators for the Information Society. In its 1st edition, the Manual consisted in the compilation of the research activities carried out by its members, which were presented and discussed at subsequent Lisbon Workshops (2001, 2003). During the 2005 Workshop, the first draft of the Manual was submitted for discussion, and the 2006 version of the Lisbon Manual was prepared with the contributions and enquiries received from the 28 countries of the Network, in addition to other external actors.

At institutional level, this survey (the Manual) benefited from the interaction with various international, regional and national institutions. Among them: the Organisation of Ibero-American States (OEI), the Organisation of American States (OAS), the United Nations Commission for Latin America and the Caribbean (UNECLAC) and its OSILAC program, the United Nations Development Program (UNDP), the Institute for Connectivity in the Americas (ICA), the Latin American Forum of Telecommunication Regulators (Regulatel)- and the following domestic organisations: Colombian Institute for the Development of Science and Technology Francisco José Caldas -Colciencias- and UMIC, Agency for the Knowledge Society, I.P. - (Portugal).

In 2008, the 4th Ibero-American Seminar on Knowledge Society Indicators was held in the city of Lisbon, Portugal. The IV Seminar was the opportunity to discuss the progress and contributions made on and to the Lisbon Manual, and certain aspects were proposed to be included in the document. A review of and an expansion of the

Manual scope was agreed-upon at that moment. The 2009 Lisbon Manual is the product of the contributions and discussions held during the Seminar. Undoubtedly, similarly to the 1st version, its disclosure is expected to contribute to the enriching and supplementing of the work presented herein.

For the chapters included in the prior version (government, business, households and ICTs sector), the structure of the Manual is consistent with the dynamics of the layout and analysis of the previous edition. That is, an initial theoretical approach to the issue (what), followed by a presentation of available measurements (how and who), and lastly, a comparison with the methodologies used by the key entities in charge of generating statistical information, which also includes a comprehensive analysis proposal. This last part has been the hot spot of recent discussion at the network and is expected to contribute to the debate on the homogenisation of indicators.

This edition incorporates two new chapters, which are at a preliminary theoretical-methodological stage; therefore, they will consist in a presentation of the subject and a state-of-the-art analysis as regards measuring. In order to facilitate its reading and in consistency with the spirit of the Manual, these chapters are organised in the same manner as previous chapters but the difference lies in that the former raises more questions than answers. Again, the dissemination of this document is expected to contribute to progress regarding answers. These chapters relate to the Matrix of Knowledge and Information Society indicators (which will be presented in the following sections) and consist in the "Universal Access" sub-row and the "Schools" sub-row.

c. General Features

The proposal has two components. Firstly, a general conceptual framework is proposed for measuring the Information Society, seeking a comprehensive approach to the analysis of these processes, so that its adoption as a common basis for unifying criteria, coordinating actions and joining strengths might facilitate joint and supplementary work by different groups, teams or individuals.

Conceptual aspects are then based on the methodological proposal known as the “Matrix of Information Society Indicators" (see Figure 1.1). This proposal has been drafted in the context of the research and development activities carried out by the Ibero-American Network of Science and Technology Indicators (RICYT).

Secondly, within the conceptual framework suggested, the aim is at making a specific contribution as to how to approach the performance of agents in this new paradigm characterised by deep change in the generation, management and circulation of information and knowledge.

These two components reflect that the proposal is equally ambitious and prudent. Its ambition lies in the intention to make a proposal that fully covers the entirety of the aspects under analysis, attempting to go further than the partial approaches that characterise many widespread methodologies for measuring the Information Society. Its coverage is also broader as it combines quantitative and qualitative procedures, instead of choosing one of these as commonly done with other methodologies. However, the proposal is prudent when defining the operational aspects and procedures to build specific indicators.

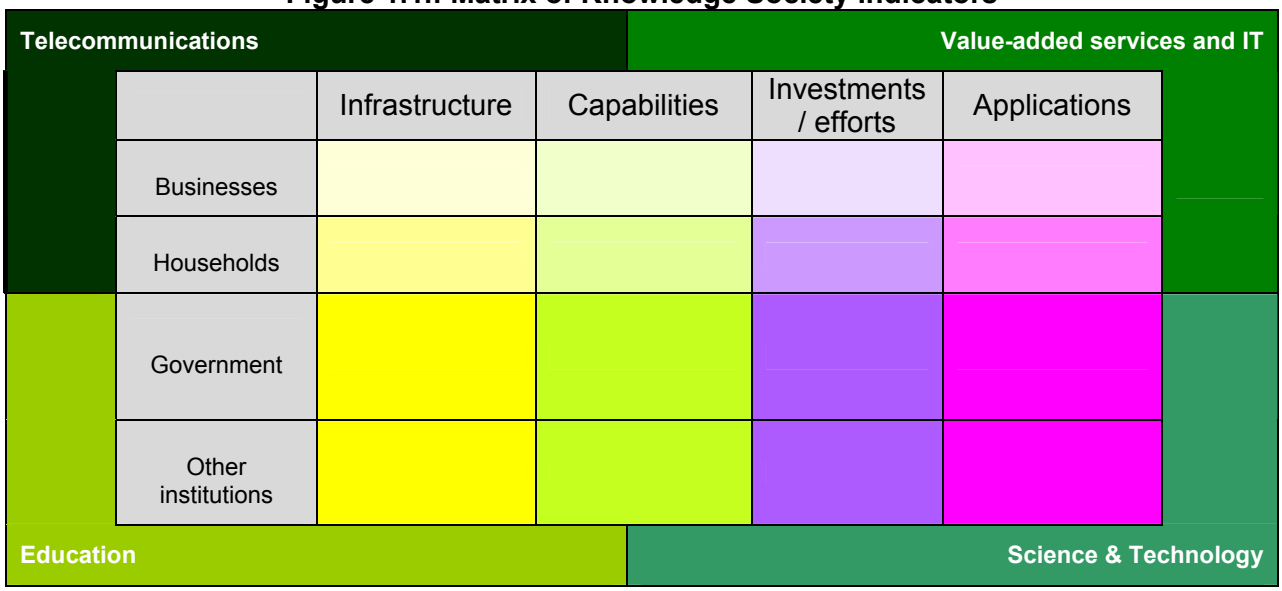
The general conceptual framework is unavoidable for setting the basis and orienting the work to be done in any specific field. Furthermore, the different contributions to be made by different working groups focusing on the construction of specific indicators

can only be brought together or combined with others if they share the same conceptual basis.

Matrix of Knowledge and Information Society Indicators

As mentioned above, the conceptual framework will be presented through the so-called "Matrix of Information and Knowledge Society Indicators". The main precedents that have contributed to the preparation of this proposal include the study "Indicadores de la Sociedad del Conocimiento: aspectos conceptuales y metodológicos" (Bianco, Lugones, Peirano and Salazar, 2002),[2] drafted in the context of the Knowledge Network Project[3] as well as two rounds of consultation with experts to discuss preliminary progress.

Figure 1.1.: Matrix of Knowledge Society Indicators



This study included the identification and analysis of nearly 20 of the most widespread methodologies for measuring the Information or Knowledge Society, prepared and/or used by internationally renowned institutions. This was undoubtedly a key input.

We must also mention the verification work carried out in cooperation with the various members of the Ibero-American Network of Science and Technology Indicators (RICYT), regarding limitations in Ibero-American statistics systems and existing restrictions on (and resistance to) modifying or expanding available statistical information. Additionally, documents, reports and papers by various authors, institutions and organisations were reviewed, which, together with the opinions of various experts, allowed for an approach to the identification of the characteristics of the transition process towards the KS in Latin America.

Based on these elements, a conceptual framework was designed to facilitate the approach to and the metrics of a process that is as complex and broad as the organisation of the Information Society in Latin America. This methodological proposal is explained and summarised in a matrix model. The use of this representation method

[2] Bianco, C.; Lugones, G.; Peirano, F. and Salazar, M. (2002): "*Indicadores de la Sociedad del Conocimiento: aspectos conceptuales y metodológicos*", Document presented at the II International Workshop on Information Society Indicators, Lisbon, 2003. Available as Working Document No. 2 at www.centroredes.org.ar

[3] COLCIENCIAS/OCT/OAS

makes it possible to more easily highlight, transfer and define the context of the key concepts and aspects involved.

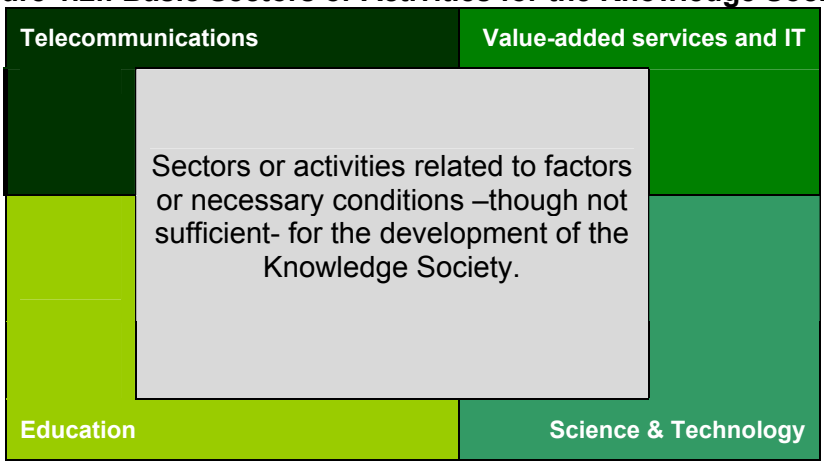
This methodological proposal can be classified as modular, gradual, flexible and cooperative due to the reasons explained throughout this presentation. As shown in Figure 1.1, the model consists of two areas. On the one hand, there are four sectors or activities that constitute the basis or support necessary to organise a dynamic and widely expanded Information Society: Education, Science and Technology, IT and High Added Value Services, and Telecommunications. These four activities or sectors constitute the "Sub-matrix for disclosing and making use of information and knowledge", which falls within the second area mentioned and that, for that reason, overlaps with the preceding one, according to the figure. This sub-matrix is organised based on four topics -infrastructure, capabilities, investments and cumulative efforts, and applications- connected with four rows related to actors –businesses, households, government and other institutions.

Basic Sectors or Activities

The levels attained by a given society in terms of education, science and technology, as well as the development of software and telecommunication industries exert influence and condition, whether favourably or negatively, the development of the KS. Precisely these sectors form the framework in which the rest of the agents and social actors attempt to make use in the simplest and most effective manner of the tools available to create and manage information, as well as the growing availability of knowledge-intensive goods and services.

Indeed, as shown in figure 1.2, the telecommunications sector provides the basic equipment and services to establish the networks that allow connections between different actors and distribution of information and knowledge. The IT industry and high added-value service sector provides the tools necessary for processing, managing and storing information and generated knowledge. The analysis of the population's educational profile makes it possible to identify the strengths and weaknesses of human resources in order to make use of tools associated with the generation and management of information and knowledge. Similarly, the science and technology sector shows the available system capabilities for absorbing, multiplying and creating knowledge and information, thus supporting the new production model.

Figure 1.2.: Basic Sectors or Activities for the Knowledge Society



With the inclusion of these sectors, the aim is at highlighting the situation and main trends of certain activities that are necessary but insufficient for the purposes of organizing and consolidating the KS. The underlying idea is simple: the less developed

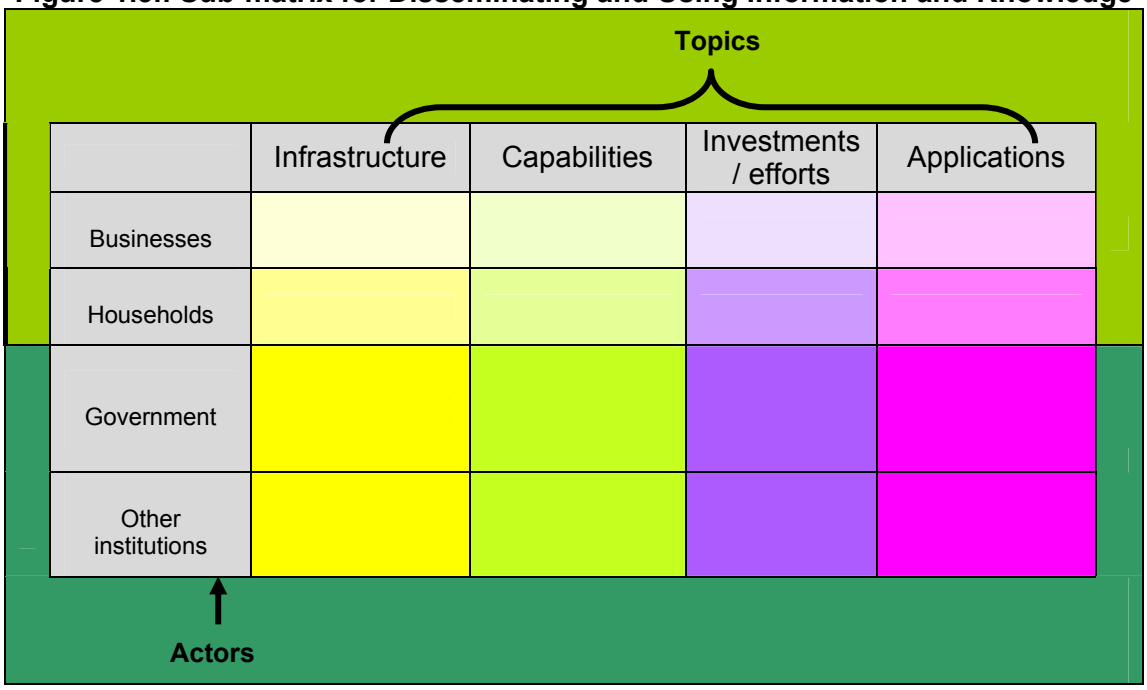
these sectors are, the more hardships and obstacles economic and social agents will come across in assimilating distinctive KS practices and tools. Although many elements are created and produced by the most developed societies, local capabilities in this respect play a key role in the pace and direction of the processes under analysis.

Lastly, it should be noted that, while not explicitly included, another necessary factor, albeit insufficient, for the development of the KS is the institutional or regulatory aspect. However, it seems impossible or even not advisable to deal with this type of matters through a quantitative measurement-oriented approach, though this does not entail excluding this topic from the analysis. In this respect, note that any set of indicators constitutes an invaluable contribution for the analysis, but cannot (and should not) replace the task of analyzing and confronting all the aspects that are part of the process under analysis. In order to do so, it will undoubtedly be advisable to rely on statistical data, but other elements beyond quantification should also be taken into account.

The Sub-matrix for Disseminating and Using Information and Knowledge

Once the sectors selected to organise the model framework have been presented, the next step is to describe the Sub-matrix for analysing the dissemination and use of Information and Knowledge (SADU). As mentioned above, this matrix is composed of four columns and four rows. The columns reflect the main theoretical variables or topics to be assessed. Social and economic actors are shown in rows (Figure 1.3.).

Figure 1.3.: Sub-matrix for Disseminating and Using Information and Knowledge



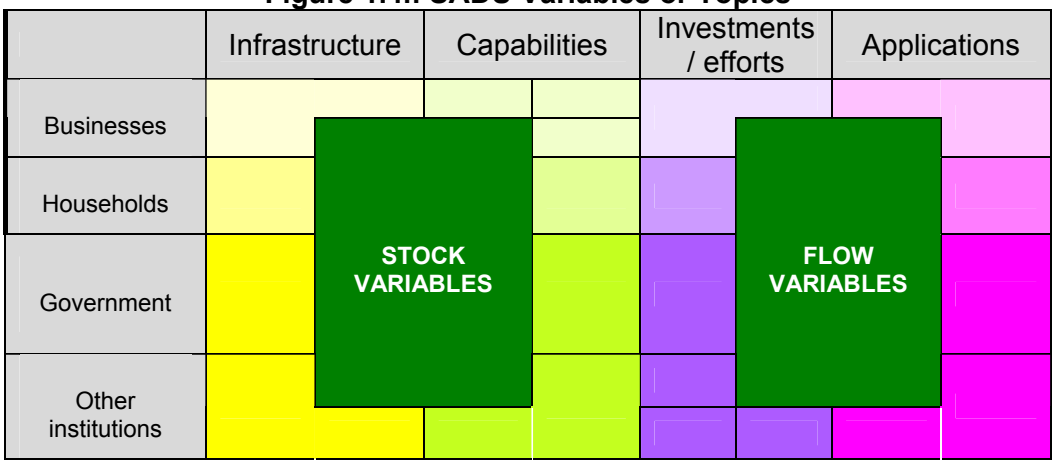
The sub-matrix shows 16 possible intersections which highlight the key aspects involved in the organisation of the KS. For example, once the information for each of the topics associated with the first box column is obtained, statistical information on infrastructure at businesses, households, government and health and education institution would be available. Then, with the second column, we would have sufficient data to prepare a chart on the capabilities situation (again, businesses, households, government, and health and education institutions). Similarly, we could find out about investments and cumulative efforts made by these actors to improve both their

infrastructure and capabilities or the applications through which they make use of available resources.

The first two topics or variables refer to matters related to the resources available to the various actors, either regarding tangible assets (equipment and other infrastructure) or intangible assets (relations to other agents or practices to improve access to or use of knowledge), and human resources (Figure 1.4.).

The last two topics, however, relate to flows; i.e. the actions, efforts and applications that result in improvements as to available resources, both resulting from flow rises -investments, for instance- or the development of new possibilities that lead to better improvement thereof -training expenses, for example. In other words, the first two topics provide information on what is available, while the last two make it possible to anticipate scenarios or identify trends; therefore, the four topics as a whole allow for a dynamic approach to the surveyed process.

Figure 1.4.: SADU Variables or Topics



As to the actors that determine the rows, there has been an attempt to build categories that make it possible to group the different social and economic agents depending on their motivation or objectives in using knowledge and ICTs. That is to say, the purpose was to establish groups of agents who share certain patterns of behaviour and that pursue similar goals. As a result of this theoretical exercise, four ideal categories or actors have been defined.

The “businesses” row includes all organisations acting under their motivation to obtain a profit that use a cost-benefit model to evaluate their decisions. Thus, many businesses reach the ICTs with the aim to increase their profit margins. Initially, they seek to reach this increase by reducing costs (efficiency improvements). Once this resource has been exhausted, many businesses continue along this path but with a view to increasing added value and differentiating their products.

The “households” row refers to persons in households in which a series of decisions are made but do not necessarily have a strict financial impact. Possibly, the goods and services inherent to the KS may help these businesses to save time, find new ways to spend their free time, easily access certain types of information and improve their know-how and education.

The “government” row represents the different official entities at the various governmental levels —national, provincial and municipal. Note that not all state institutions fall into this category. The criterion is to group those areas whose main function is administration. Generally, this includes the different areas of the executive,

legislative and judicial branches. State institutions having other specific objectives, such as the supply of goods or services, are included in the last category (e.g., universities, schools, hospitals, security forces, research centres).

Thus, the last row proposed is, undoubtedly, a theoretical construction that relates to the need to continue expanding the matrix to include as many rows as the local situation and the dynamics of the KS require. In that regard, the steps to be taken include performing a breakdown into various rows in order to progress in the study of non-for-profit institutions, knows as e-health, e-education (incorporated in this new version), universities, private actors not contemplated in the other rows (organisations and chambers). Indeed, we could think of a first breakdown level between other institutions of the private and public sector. In any event, this row suggests the need to progress on the analysis of a complex and multiphase process and, in order to reach progress in consistency with measurement possibilities, this breakdown should allow for direct connection with the sectors of the domestic account system, particularly considering that one of the objectives of statistics in this field is the obtaining of a satellite account in the ICT sector.

The approach based on these four actors derives from a choice and, undoubtedly, is not the only way to deal with the broad and complex set of situations that result from the organisation of the KS. The option for this alternative is justified by the fact that it is the best way to combine the ability to provide explanations and the feasibility of the application. Moreover, note that this facilitates “debate” with other methodologies since the categories proposed (rows) can be easily associated with the concepts of e-business, e-Government, e-entertainment, e-learning, e-health, etc.

At any rate, there is no doubt that this is only one of many possible alternatives. We also analysed the possibility of defining four or five basic functions —for instance, research, business and production, administration, entertainment— as units for analysis. In the current state of organisation of statistical systems, however, this alternative would entail enquiring each agent on the infrastructure focused on research, business and production, administration, entertainment, etc. multiplying the required information. Even though we find that the ability to explain these ideas may result more attractive that the mere "actors approach", it is also true that this is the structure used to organise and produce a large part of statistical information, through surveys to businesses and households, and records of activities and resources from the government and health or education sector.

Chapter 2: Access, Use and Organisation of ICTs in Government

Introduction

During the last few years, Ibero-American national governments have introduced information and communication technologies (ICTs) in their related structures and have implemented policies to foster and regulate their use and promotion. All in all, the current scenario shows that there have been certain differences as to the level of penetration of ICTs and the implementation models applied by each government, which hinders international comparison.

In addition, it is difficult to balance functions and government levels, and to homologate the various strategies undertaken both by the government and its relation to society. This becomes evident, for instance, upon trying to analyze the penetration of ICTs through supply indicators (online service availability). While in some countries computer services are associated with tax issues, in others progress has been made in the search for transparency and accountability improvement. In both cases, progress can be remarkable, but the identification of an indicator capable of capturing or evaluating priorities or strategies at national level becomes an extremely complex task.

That notwithstanding, even though national priorities or government structures may differ, that should not prevent the design of internationally comparable indicators. Given that the final goal common to policy makers and statistical information users is –or should be- improving the efficiency and efficacy of the entities associated with the public sector, designing internationally comparable indicators should lead to improvements in government, irrespective of the institutional framework or national strategy.

This entails rethinking the definition of e-Government. During discussions as to the approach to the "Government" row in the Lisbon Manual, it became evident that it was necessary to review the approach to the question of the transition to the KS in the government in order to find comparable indicators. Furthermore, the importance of reconciling the concept of "e-government" and "e-administration" was noted. The steps to be taken show the need to attempt comparative measurements of public actors upon facilitating and promoting the transition to the Knowledge Society.

a. What is e-Government?

Analysing ICTs' penetration in the government would involve measuring the manner in which these technologies act as support for these organisations' activities, and their influence on the methods and quality of interaction between the government and the rest of the community.

The government row in the matrix is nothing but the analysis of e-Government, digital government or e-Government. As in other fields, this concept has evolved with the lapse of time and despite certain basic consensus, the definitions and scope allocated to e-Government show variations from one country to another or even among institutions. According to Quevedo (2007), digital government was defined, at an initial stage, as the normalisation of government areas plus the automation of processes and the implementation of an institutional website for information and service provision. While the various government levels progressed in this process, e-Government focused on the back-office where process changes purported changes in the manner in which the State was administered. Thus, the efficacy-oriented administrative logical approach was transformed into a community service-oriented approach.

In this sense, we found three types of priorities that guided the implementation of ICTs in the Government:

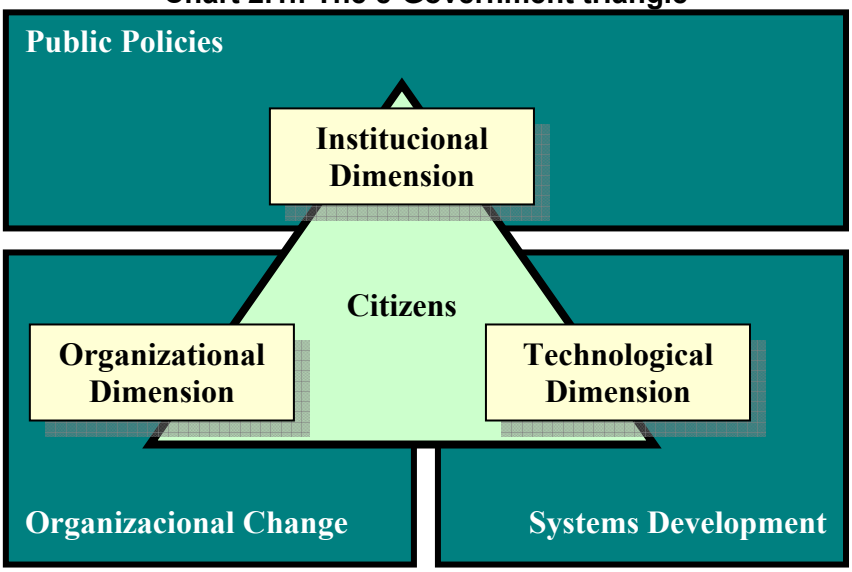
a) supporting governmental activities,

b) supporting interaction with citizens,

c) implementing organisational changes to modify the role of the government in the social and economic environment.

However, it seems impossible to think about these dimensions as isolated compartments. On the contrary, the characteristics of the transition to e-Government will be the result of the progress made in these three dimensions. In that regard, Suárez (2008) drafted a chart on e-Government based on three key dimensions, as shown in Chart 2.1. This approach shows that any methodological perspective should include the development of indicators capable of monitoring the institutional dimension –general regulatory framework, express public policies, consensus generation, systematic efforts-; the technological dimension -hardware, software, human resources- and the organisational dimension –changes in government, processes, routines, interaction with citizens.

Chart 2.1.: The e-Government triangle



Source: Suárez (2008)

Nowadays, national priorities seem to focus on two diverse but supplementary dimensions: e-Government and e-administration. The first one refers to the manner in which the Government "participates in the use of the ICTs (…) to improve the set of substantive and operational tasks of the government (e.g. planning, budgeting and execution of programs and projects), electronic provision of services (information, proceedings, records, etc.) and the incorporation of citizens in public affairs (communication, enquiry, debate, audit, among other activities)" (Estrada, 2008). Electronic government is therefore the combination of the three dimensions mentioned above: the use of ICTs in Government and the relation to citizens as well as the change in the role played by the State (from service supplier to development promoter).

Digital or electronic Government is, therefore, one of the dimensions associated with e-Government and is related to the operational dynamics of the State as institution in charge of managing knowledge and information, which must account for its actions. Electronic administration is usually referred to as back-office and involves the

digitalisation or informatisation of processes and routines, as well as a change in proceedings and support of organisational routines.

Now, despite any theoretical distinctions made on priorities, it seems impossible to think of these dimensions as isolated compartments. On the contrary, the challenge faced by the governments is to progress in the development and implementation of a digital schedule capable of driving a social integration, economic development and improvement process for the general welfare of society. To that effect, ICTs are considered key tools to improve the efficiency and efficacy of the government activity (back-office), which will also make it possible to rely on better ways to interact with citizens (front-office). To facilitate this, it will be necessary to implement supply quantity and quality improvements (possibility to carry out online procedures, availability of information, compliance with regulations), improvements in the skills of those who are part of the government and, basically, establishing and improving the digital skills of users. Once again, this relates to the role played by the State as facilitator and promoter of the transition to the Knowledge Society.

Thus, even though e-Government entails thinking the three dimensions as a whole, the search for common aspects suitable to set the basis for defining comparable indicators continues making partial reference to the process.

In accordance with OECD (2003), e-Government is “the use of information and communication technologies, and particularly the Internet, as a tool to reach a better Government”. The definition adopted by the European Union (European Commission, 2003) is also focused on the use of ICTs for government, which must be combined with the “organisational change and new capabilities to improve public services and democratic process, and to strengthen the support to public policies”.

In Latin America, even though there is no entity similar to Eurostat or OECD to make definitions homogeneous, the Program for the Economic Commission on the Information Society for Latin America and the Caribbean (CEPAL), as main referent in the field for the region, defines e-Government as “the selection, implementation and use of information and communication technologies in the Government for the provision of utilities, the improvement of management efficacy and the promotion of democratic values and mechanisms, as well as the development of a regulatory framework to facilitate the initiatives that use information intensively and to promote the Knowledge Society”. (2003 and 2006, in CEPAL, 2007)

Given the close relationship between the concept of e-Government, and particular needs and national strategies, differences in the definitions apparently result, to a great extent, from the differences in the level of development of the various countries. Consequently, while in some countries e-Government has reached considerable development (reflected in progress such as the computerisation of tax returns and payments), in other countries the need to establish IT information portals and set up telephone help lines for citizens still prevails. This is probably the main reason to be taken into account upon applying indicators tested or prepared in developed countries. If indicators only allow the conclusion that some countries are more developed than others, then the efficacy of the indicator becomes irrelevant as a result of the obvious nature of the conclusions drawn from them.

Furthermore, the possibilities to progress on the construction of internationally comparable indicators depends then of the ability to duck the obstacles resulting from the presence of multiple administrative methods associated with the various forms of Government, as well as the availability of different strategies and national and regional priorities.

b. Why Measure e-Government?

If e-Government is understood as the introduction of ICTs into the government sector regarding each of the aforementioned dimensions (e-administration, interaction with citizens and improvement of participation), it is important to progress on the analysis of the causes that justify or render its measurement necessary in order to adequately outline the construction of the appropriate indicators.

In the case of European Union member countries, the indicators were built simultaneously to the implementation of consecutive e-Europe plans as instruments for monitoring and improvement (EC, 2000, 2002 and 2005). For developing countries, instead, measuring e-Government would perform a double function: monitoring improvements –or setbacks in the efficiency of the government sector and generating inputs for policy development. In addition, we should consider the lack of a regional plan; therefore, the information generated in each country is related to national needs which are not always consistent with the problems or requirements of actors who intend to observe the regional area or even demand in those countries, requiring indicators suitable to define relative positions.

Moreover, fostering the implementation of ICTs in the various sectors of society is a task that, in a way, should be performed by the government sector given its ability to drive the implementation of ICTs in the rest of society. Therefore, the second function of these indicators is to become inputs for analyzing the best degree and manner of translating e-Government development into increased ICT penetration among households and businesses. In other words, e-Government indicators are also a degree guideline to assess transition and commitment by Government authorities regarding the KS.

National specifications are irrelevant and, in this sense, any indicator intended for application region-wide should somehow be included therein; however, comparable indicators for developed countries and developing countries constitute a key tool to monitor progress or setback both nation and region-wide. Otherwise, the national analysis would be limited to an inter-timely comparison, without the possibility of knowing if the gap regarding the maximum benefit that may be obtained from ICTs has expanded or diminished.

c. How to Measure e-Government?

The implementation of e-Government involves facing and overcoming the obstacles that every change originates: costs, resistance to change, gaps in regulatory framework, technological obsolescence in Government, deepening of social differences, fragmentation within administration, institutional inaction, etc. The different costs and obstacles reinforce again the importance of understanding e-Government as a process that is only possible if it can simultaneously rely on political decision, technology and organisational innovation.

In this sense, pursuant to the findings of Estrada (2008) and Finquelevich (2008), the measurement of e-Government calls for indicators focused both on the characteristics inherent to the relation among ICTs and the government and those focused on the reality of actors. Ultimately, ICTs are nothing but instruments operated by individuals.

Pursuant to the Matrix, this approach based on the perspective of actors entails knowing the degree of availability of basic capabilities for using ICTs. These capabilities should be present among users of front-office and back-office technologies. The first set of capabilities is partly associated with the educational profile of the

population (one of the basic sectors) and the rest with the remaining rows (particularly, the households and businesses rows).

The second set of capabilities should be associated with e-Government indicators. Again, from a matrix perspective, this is what is included in the “capabilities” column in the Government row.

In accordance with the approach proposed in the matrix, infrastructure, applications and efforts reflect the level of progress and commitment regarding the transition to e-Government. The indicators arisen therefrom are those traditionally used for measuring investments and stock. As regards infrastructure and efforts, the indicators generally used refer to the availability of online services and, as regards relative budgetary measure investment such as expense levels versus general budget or GDP. Unfortunately, in the case of infrastructure, more progress has been made in measuring front-office (web) that back-office; probably given the complexity that entails surveying information on the technologies available to the Government. As regards budgetary expenses, even though this information is available for all public budgets (in some countries and government levels with more strength that others), the information is not always available, or is hard to access or even hard to identify (the description under which ICTs expenses are entered is not necessarily the same in all countries).

Another aspect to be taken into account upon measuring e-Government is that associated with context factors. The implementation of the digital schedule involves an institutional dimension that is capable of progressing on the development of access and dissemination policies, both regarding infrastructure and capabilities. The institutional dimension of e-Government is related both to decisions on ICTs and the impact of the context: the level of relative development, economic, financial and political stability, and institutional enforcement. In this context, e-Government-oriented policies are developed (definition of a general regulatory framework, express public policies, search for consensus, systematic efforts, etc.)

Context circumstances, though not expressly included in the matrix, are necessary for any analysis aimed at explaining e-Government reality. That notwithstanding, these determining factors impact not only on e-Government but also on each area of society; therefore, even though in some cases it is necessary to include them (for instance, in countries having a high percentage of population without access to electricity, it seems illogical to expect a great degree of penetration of technologies that require electric power to operate). In many cases, context indicators may contribute to describe the country and to understand the dispersion existing in the country. Therefore, it seems convenient to move forward in the construction of a minimum set of indicators to reflect these circumstances, which can also be positively used for other knowledge areas and not merely as a sub-group within e-Government indicators.

c.1. OECD

The work of the OECD in the homogenisation of indicators to measure the transition to the Knowledge Society begins in 1997, with the Meeting on Indicators for the Information Society in the context of the Statistical Panel for Communications, Informatics and Information Policy. In 1999, such panel transformed into the Working Party on Indicators for the Information Society (WPIIS). Since then, WPIIS has worked for the consolidation of a set of indicators capable of solving organisational and methodological problems associated with the development of standardised forms for measuring penetration and use of ICTs in the different areas of society.

Since 2005, the recommendations of the OECD are compiled in the *"Guide to measuring the IS",* prepared by the Working Party on Indicators for the Information Society (WPIIS), published in 2005, and reviewed in 2007, and e-Government for better Government document of that entity (OECD, 2005 and 2007). From 2008 to 2009, this Guide continued under review –basically as regards the classification of ICTs goods- and publication of the new edition is expected by late 2009.

The Guide provides recommendations for measuring demand and the use of utilities by households and business, similar to those recommended by OSILAC and Eurostat (see c.2. and c.3.). As opposed to the specific question on the interaction with public entities used by Eurostat, in the case of the model suggested by OECD for household surveys, this information is limited to three items within the possible uses of the Internet (Table 2.1.). For businesses, instead, there is a specific question, similarly to the case of Eurostat, which allows to obtain more information on the interaction of these and the Government (Table 2.2.). However, as long as the difficulties related to the definition of "Government" are recognised, the question for businesses is included for the entire set and not the key set of proposed indicators.

Table 2.1.: Question as to the Interaction of Businesses and the Government – Sample ICTs Survey for Businesses (OECD)

Did you business use the Internet to interact with government organisations during <period>*?	
Mark as appropriate	
To obtain information on governmental organisations (for instance, from websites or through e-mail)	
To download or request government forms	
To fill in online forms or send completed forms	
To make online payments to government organisations	
Other government interactions (please specify).....	
No use of the Internet to interact with government organisations	
* No fixed period is recommended; however, member countries are suggested to align their surveys as much as possible.	

Source: OECD (2007)

Table 2.2.: Question as to the interaction of households and the Government – Sample ICTs Survey for households and individuals (OECD)

Which of the following activities did you use the Internet for in the last 12 months for private purposes?	
Interaction with government organisations	
To download or request government forms	
To fill in online forms or send completed forms	
Make online payments	

Source: OECD (2007)

From an offer perspective, the recommendations arise from the "e-Government for better Government" document (OECD, 2005), where e-Government measurement is considered based on three dimensions:

a) demand for electronic services;

b) government demand for ICTs; and

c) government supply of electronic services.

Despite this three-folded approach, measurements still focus on the demand approach. Since the WIIPS, the need to improve the methods for impact of ICTs on the quest for a "better government" has been recognised; however, the hardship inherent to identifying the agent or institution that should report on progress made on e-Government (national or state, ministries or agencies, etc.) is known as well.

Therefore, while measurement from the demand fall in the area of ICTs indicators and their level of homogenisation is significant, the establishing of e-Government indicators with the meaning given in this document is at preliminary stage and progress made on consensus can be assessed based on the activities of specialised groups, such as the Global Governance Forum or the Public Administration and Governance program.

c.2. EUROPEAN UNION / EUROSTAT

In order to solve the structural differences from one country to another, in the case of the European Union, e-Government has been measured in two ways: based on demand and based on supply. Both approaches result from consecutive e-Europe plans (2002, 2005 and i2010) (EC, 2000, 2002 and 2005).

The i2010 plan, currently in force, is basically divided into three large blocks. The first one corresponds to the modernisation of the regulatory framework -in order to guide it to trade, make it more open and applicable to digital economy-, the need to broaden research regarding ICTs and the improvement of utilities and life quality through the inclusion of the IS. The purpose of that measure is to transform e-Government into a means to improve the life quality of all citizens.

As regards e-Government, note that greater progress has been made on the improvement and expansion of e-services than on e-health and administration, despite the launching in 2006, of the EU health portal (www.ec.europa.eu/health-eu) and the progress made by local governments in specific e-health strategies (a compilation of good practices is expected shortly, which will hopefully contribute to better evaluation in that field).

A remarkable aspect of e-Government strategy is that it is part of an integral plan for transition to the KS, which ultimately reflects a strategy for implementation of ICTs based on the improvement of the life quality of citizens and the rise of business competitiveness and profitability.

To evaluate prior plans and the current i2010 plan, the metric to be used and standards to be applied were specified. The measuring of the penetration of ICTS in the Government is based on two information sources: surveys and an online utilities analysis performed by Information Society and Media General Manager.

The ICTs surveys made to households and businesses include a specific question on the use of the Internet to interact with public authorities and, in the case of businesses, it includes in the question on electronic data exchange an option regarding interaction with the public sector (irrespective of the use of the Internet). These questions reveal the degree of use of these services through demand and are useful tools to compare countries as to the degree of use of utilities by households and businesses. These questions are presented in Tables 2.3 and 2.4.

Table 2.3.: Question as to the Interaction of Businesses and the Government – Sample ICTs Survey for Businesses (EUROSTAT)

Did your business use the Internet to interact with government organisations during <prior year>?		
	YES	*No*
To receive information		
To receive forms, for instance, tax forms		
To submit completed forms, for instance, supply of statistical information to public entities		
To perform administrative proceedings (e.g. returns, records, authorisation, request) fully electronically, without hard copies (including payment, if applicable)		
To submit a proposal in an electronic bid or competitive action (e-procurement) (through the e-system, itself, not by e-mail)		
Did you use automated exchange of data for the following purposes?		
	YES	*No*
(…)		
Send or receive data from/to public authorities (e.g. taxes, statistical data, etc.)		
(…)		

Source: EC (2008a)

Table 2.4.: Question as to the Interaction of Households and the Government – Sample ICTs Survey for Households and Individuals (EUROSTAT)

For which of the following activities related to the interaction with the Government or utilities and in what period did you use the Internet for private purposes?		
Mark as appropriate	*In the last 3 months*	*In the last 12 months*
To obtain information from the website of public authorities		
To download official forms		
To deliver completed forms		

Source: EC (2008b)

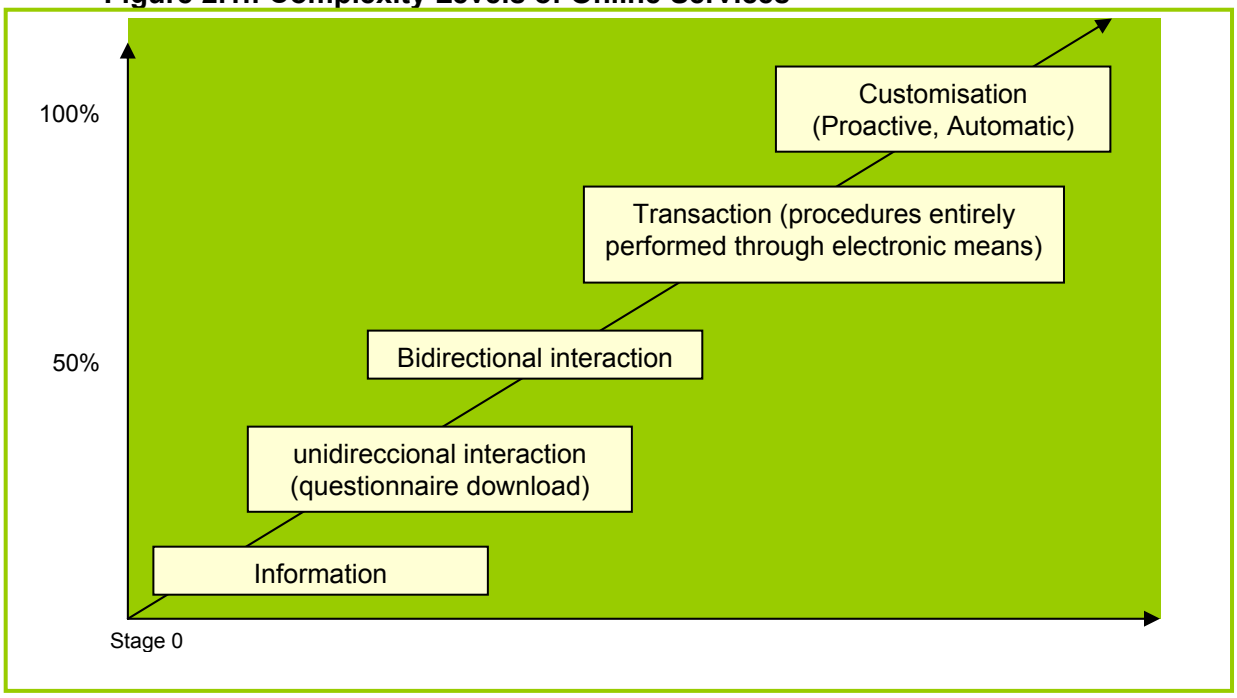
The second information line consists in a supply-oriented approach and is based on the analysis of the availability of online services. It is carried out on the basis of an annual frequency survey based on the account recording of the number of utilities offered through the web and the level in which taxpayers may perform services entirely online. To that effect, 20 services, defined from the beginning of these measurement in 2001, were considered, out of which 12 correspond to the use by households and 8 by businesses. (Table 2.5) At the same time, progress on the availability of these services is analysed based on a ranking that takes into account 5 computerisation stages. (Figure 2.1)

Table 2.5.: Services Offered through the Web

Citizens	Businesses
Income taxes	*Employee social security contributions*
Work searches	*Corporate taxes*
Social security benefits	*Value-added tax*
Personal documents	*New company registration*
Automobile registration	*Presentation of information to statistical offices*
Construction permit request	*Customs declaration*
Police reports	*Environment-related permits*
Public libraries	*Public procurement*
Certificates	
Registration with the High Education Board	
Change of domicile notice	
Health-related services	

Source: EC (2007a)

Figure 2.1.: Complexity Levels of Online Services



Source: EC (2007a)

As opposed to the prior model (which only considered 4 stages), this model makes progress as regards complexity through the "customisation" level". The purpose is to establish if the services provided through the website are limited to providing information (stage 1), if they enable unidirectional interaction based on, for instance, the downloading of forms (stage 2), if interaction is bidirectional (stage 3), if the level of development entails that the interaction between the government and citizens is entirely virtual (stage 4) or if interaction is also proactive and/or automatic (stage 5).

Based on these two information sources, we estimate the benchmarking indicators specified in the i2010 plan (even though, undoubtedly, other two indicators can be obtained to be used in specific national and regional reports). The list of indicators is submitted in Table 2.6.

Table 2.6.: Benchmarking i2010 (Eurostat)

Electronic government
1. Number of utilities fully available online
2. % of individuals who use the Internet to interact with public authorities, breaking them down by purpose (obtaining information, obtaining forms, delivering completed forms).
3. % of businesses that use the Internet to interact with public authorities, breaking them down by purpose (obtaining information, obtaining forms, delivering completed forms and e-procurement).

Source: EC (2007b)

Pursuant to the specifications of this method, the review of the approach allows to incorporate the concepts of "proactive service delivery" and "automatic service delivery". In the first case, the purpose is to capture the degree in which the service provider intends to improve the use experience through, for instance, the automatic filling of forms (with information existing in government databases) and, in the second case, the existence of warnings or notices adequate for the specific user (EC, 2007a).

Despite these changes in methods, the original criticism to its assumptions continue being fully valid. Firstly, criticism was received to the implementation of ICTs as a lineal process where the complete development of a stage enables progress to the following stage (Kaufman; 2007). Secondly, these indicators allow to define if the availability and use of online utilities corresponds to the performance of organisational changes and the search for improvements in efficacy and capabilities of public entities, which in the case of less developed countries is essential for analyzing the transition to a better Government. Lastly, we find the selection of the services to be evaluated. Even though it is likely that they relate to the characteristics of EU member countries, it is not possible to assume that the relevance of these services is equivalent in the countries of the region (both considering the use of demand and the impact on the daily activities of the entities).

Consequently, even though we could think about a service list that allows for international comparison, supposing that the transition to e-Government is carried out in parallel (and lineally) with progress made on digitalisation of services does not allow to understand the extent in which Government move towards more efficient, effective and participative public administration models.

c.3. UNITED NATIONS / ECLAC / OSILAC

The activities developed by OSILAC fall in a broader structure, namely the Strategy for the Information Society in Latin America and the Caribbean (eLAC),[4] which, through various commitments to the countries of the region, intends to align the objectives of the World Summit on the Information Society and the Development Objectives for the Millennium. In this context, OSILAC is seen as the institution in charge of monitoring the plan and, consequently, its goals as to homogenisation should guarantee the monitoring of the topics contained therein: education and training, access and infrastructure, health, public administration and electronic government, producing sector and electronic businesses, and strategy and policy instruments.[5] That notwithstanding, given the scarce level of development of the statistical systems of the region, most of the goals included in the strategic topics are qualitative in nature, which

[4] http://www.eclac.org/socinfo/elac/
[5] See Chapter 3, section c.3.

allows us to present clear benchmarking indicators (only 20% of the goals are quantitative in nature)[6].

Precisely in the context of the subsequent eLACs, and pursuant to the activities carried out in the context of the Partnership on Measuring ICT for Development (which also joins entities such as ITU, OECD and UNESCO), OSILAC has made progress in the organisation of a set of indicators suitable to allow international comparison between developed and developing countries.

As regards the specific case of the measuring of ICTs penetration in the public sector, recommendations were made (and indicators proposed) are also based on estimates on demand in order to homogenise a minimum set of indicators. Therefore, a proposal was made for breakdown of the use of the internet by type of activity within key indicators for the household and business sector (key indicators in the case of households, and the extended set in the case of businesses) (Tables 2.7 and 2.8) (OSILAC 2004, 2005a and 2005b).

Table 2.7.: Key Indicators on ICTs Access and Use: Households and Individuals

H – 10 Activities performed through the Internet during the last 12 months

Response categories:
• Obtaining information
  - On products and services
  - Related to health or health services
  - From governmental entities / public authorities through websites or e-mail
  - Other general information or searches in websites
• Communication
• Purchase / order products or services
• Electronic banking and other financial services
• Education and learning
• Performing transactions with government entities / public authorities
• Entertainment activities (leisure time)
  - playing / downloading video or computer games
  - getting movies, music or software
  - reading / downloading e-books, newspapers or magazines
  - other entertainment activities

Source: OSILAC (2005b)

[6] "San Salvador Comitment", approved by the 2nd Ministerial Conference on the Information Society for Latin American and the Caribbean, San Salvador, February 6 to 8, 2008. Available at: http://www.eclac.org/socinfo/elac/

Table 2.8.: Key Indicators on ICTs Access and Use at Businesses:

B – 12 Portion of companies using the Internet per type of activity

Response categories:
• E-mail through the internet
• Obtaining information
  - On products and services
  - Related to health or health services
  - From governmental entities / public authorities through websites or e-mail
  - Other general information or searches in websites
• Electronic banking or other financial services
• Performing transactions with government entities / public authorities
• Customer services
• Online product distribution

Source: OSILAC (2005b)

Note that this list is currently subject to review and that a new reviewed list of indicators is expected by the end of 2009. This results from the need for consistency with technological progress –for instance, based on the inclusion of new activities for interaction of citizens and public authorities- and at the same time approving indicators with the recommendations of the Partnerships and the progress by OECD and Eurostat. Moreover, given the progress made in national measuring systems, it is expected that future recommendations will not include any distinction between basic indicators and the entire set, and a specific electronic government module is expected to be included with a minimum set of supply indicators.[7]

Furthermore, although the Eurostat surveys and OECD proposals allow for greater identification of the activities in which the Internet is used to interact with public authorities, the proposals made by the Partnership on Measuring ICT for Development, in general, and by OSILAC, in particular, allow a minimal level of comparison to start moving forward. For the Latin American countries that adhere to the recommendations of this entity, the amount of specific information obtained is limited, but the amount of information on ICTs originated in the region is limited as well (in fact, not all countries have ICTs surveys for households or businesses).

In consistency with the search for Latin American indicators and, similarly to the methodology applied by Eurostat, progress has been made at OSILAC as well regarding the measuring of ICTs based on supply, even though the level of consensus in the region is lower (which purports a greater generation of information); therefore, available indicators are based on aggregate indexes. The Government Readiness Index, the internet presence index and the web presence sophistication indicator, calculated by the UN Department of Social and Economic Affairs, are the ones more used for comparative analysis (UN, 2008).

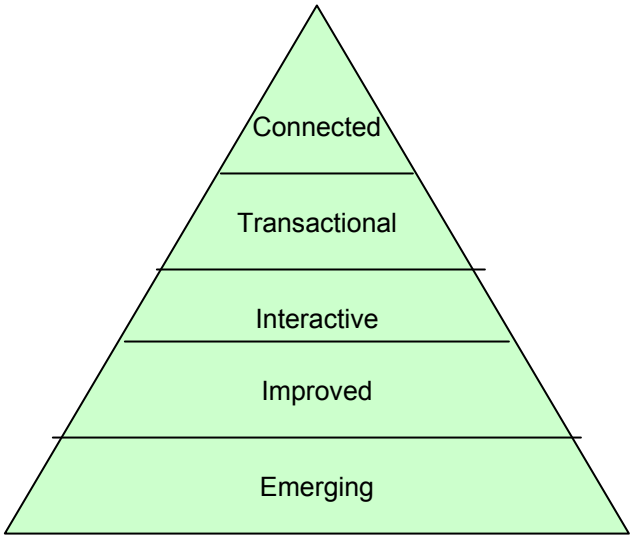
The indicators associated with the web result from a structure similar to that proposed by Eurostat. It involves a five-stage model that represents complexity levels as obtained from official portals and a pre-established set of ministries. Even though the names of stages differ as to the structure used by Eurostat, stages can be easily

[7] For more information, see the documents and presentations made at the 5th Regional Workshop on Information Society Measurements for Latin America and the Carribean, available at www.eclac.org/SocInfo/OSILAC/.

compared (as shown in Figure 2.2.); therefore, they face the same limitations as the analysis carried out by the EU: the underlying assumptions consist in understanding that the electronic government may be analyzed from the perspective of the supply of web services and that the process for transition to the KS is linear.

Pursuant to the approach under this index, “as long as countries move up towards the connected government stage, they go through various thresholds in terms of infrastructure development, content delivery, business re-engineering, data management, user security and management. Each State faces a similar number of challenges while going up in the pyramid and the manner in which States face these challenges will determine their pace”.

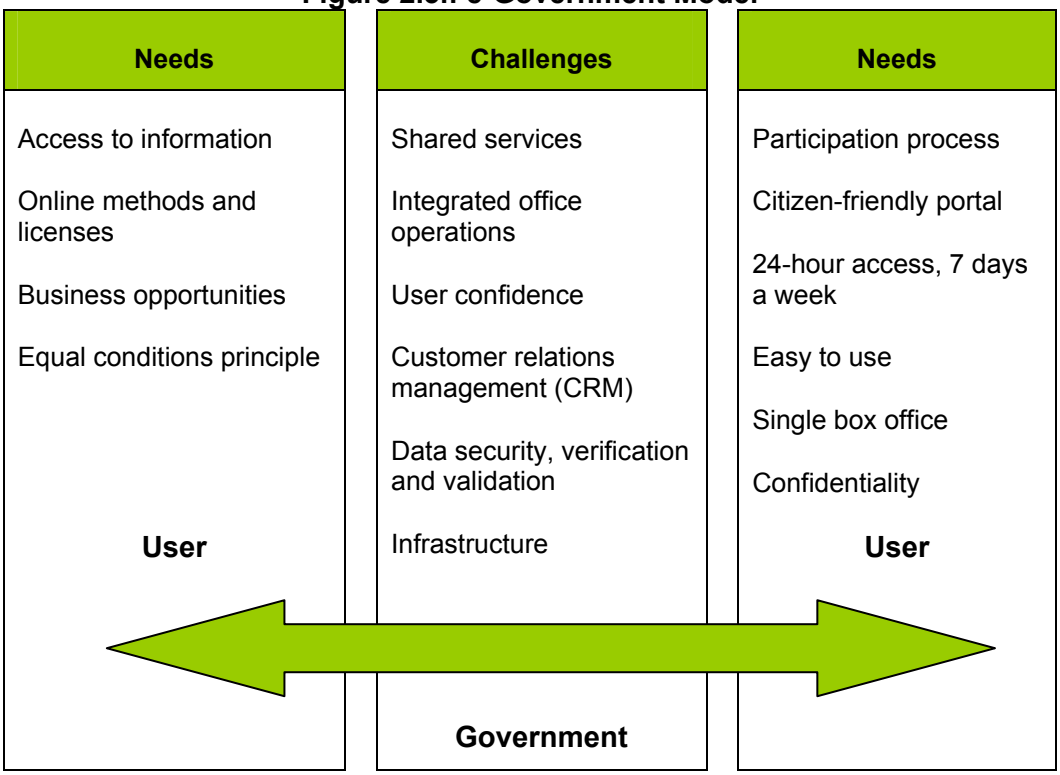
Figure 2.2.: Web Measuring Index Stages



Source: UN (2008)

The Government readiness index (reflected on Figure 2.3.) is aimed at showing “the level of preparation of Member States to take advantage of the opportunities offered by IT developments" and combines in a single measure indicators of web complexity and presence, human capital and telecommunication infrastructure. In the last publication of 2008, the focus was on the relation between the government and the citizens, and the interaction among members of the government and, to a lesser extent, the relation between the government and the companies. Thus, this indicator exceeds the estimate limited to the supply of services and is available to 192 UN member countries.

Figure 2.3.: e-Government Model



Source: UN (2008)

In short, similarly to the Eurostat proposal and the work done by OECD member countries, those nationwide produces of statistical information that follow UN recommendations will be generating internationally comparable information.

Another issue where OSILAC has made progress is the identification and characterisation of good practices and successful cases, particularly the online setting of the CyT DES,[8] which constitutes a body of science and technology public policies for development. This initiative supplements the subsequent workshops on the measuring of the KS, addressed to national offices in charge of generating ICTs statistical information, promoting the exchange of experiences and the generation of consensus, which largely enabled the organisation of the ICTs Statistical Information System.

Lastly, it should be noted that such period may differ from one country to another. The reference periods for the surveys to Eurostat households correspond to the three and twelve months prior to the time of performance of the survey and, in the case of businesses, the immediately preceding calendar year. In the case of OECD, as shown in Tables 2.1 and 2.2, although in previous recommendations reference was made to specific years −previous, current and next− in the last proposals no specific period is defined for businesses and the last 12 months are proposed as a reference for family cases. Lastly, in the recommendations by OSILAC, the reference period is based on the last 12 months, both for households and businesses.

d. Towards a Strategy for Measuring e-Government in Ibero-America

The transition to e-Government is defined in various manners, with differences more or less associated with the informatisation of public administration and the search for a new concept of government. The definitions include those based on an efficacy

[8] http://www.cepal.org/iyd/

administrative logic to those that propose a new approach to public administration oriented to providing a service to the community.

This multiplicity of definitions hinders the creation of internationally comparable indicators. During the 4th Seminar in 2008, the need to reconcile approximations becomes evident as long as the two generalised approaches, though supplementary, lead to different indicators. Based on the comments made in the previous sections, two basic types of definitions can be distinguished:

a) Those that apply the concept of e-Government as a change in the public administration model characterised by a transformation in the role of the government, i.e. the transition from a regulatory and controlling role to a role of supporter and promoter of the initiatives of the civilian population.

b) Those that apply the concept of e-Government to refer to the degree of dissemination of an ICTs-based connection in the government-citizens/businesses relationship.

The set of information to be surveyed as proposed by the OECD, in addition to the ECLAC suggestion, corresponds to the second type of approach, focusing on the analysis of the use by citizens of front-office technologies. However, this does not allow us to distinguish between lack of use due to reasons that correspond exclusively to users —for instance, lack of an Internet connection or unavailability of basic capabilities to operate with it— and lack of use due to unavailability of an online service. This type of failures may not be relevant to developed countries given that they are deemed overcome. However, in the case of countries where information is an input for policy development, the lack of these elements can be erroneously interpreted confusing lack of demand and lack of supply or vice-versa.

During the last few years, both the European Union and CEPAL have tried to combine both approaches. In the case of the EU, progress has been made in the measuring of supply even though indicators continue focusing on front-office technologies. We find that the measuring of e-government, pursuant to the indicators presented, results from a stock logics; i.e. availability or unavailability of services, and the measuring of use thereof by households and businesses. Even though Eurostat is progressing towards the development of forms that make it possible to capture issues as obstacles, the current measuring method does not allow capturing such issues, or missing or nonexistent capabilities, citizens' needs and efforts oriented to their use. Therefore, even though the set of indicators enables the evaluation of a policy aimed at implementing ICTs, it may be less operational for design and implementation of those policies.

The indicators used by CEPAL capture a larger number of characteristics about the transition to e-Government in the countries of the region and also their international comparability. However, as opposed to the EU countries, it is evident that given the lack of progress in the generation of basic statistics (such as demand and use by citizens), it is not appropriate —and even not logical— to try to agree on more complex indicators that exceed the limitations of those now in force (which result from aggregate information).

Another issue that became evident during the 4th Seminar was the need to distinguish between e-Government and e-administration; these are supplementary concepts that call for different approaches. The diverse degrees of development in the region, the typical and historical problems in some cases, and the need to improve the efficacy of the public sector reflect the urge to prepare programs and policies aimed at improving

day-to-day operations in this sector. Thus, the transition to e-administration constitutes a key aspect for the search of a better government.

Based on the contributions and debate held at the 4th Seminar, it would seem appropriate to move towards a set of indicators for the Ibero-American region that analyses the availability and use of online utilities, but which, at the same time, provides information regarding existing obstacles. Probably, the services to be surveyed are not the same as those usually surveyed by European countries given that national circumstances and strategies are considerably different. However, it is must be had in mind that irrespective of the selected set of services, these should reflect a minimum degree of comparability in order to allow monitoring, among other aspects, the existing gap among countries of different regions.

In this sense, progressing in relation to "e-administration" indicators is probably a good way of starting to measuring e-Government based on the second approach (together with demand indicators, of course). To that effect, finding comparable indicators is not necessarily a complex task; on the contrary, the backward state of some of the most simple tasks is such that indicators of time and cost of ordinary procedures (for instance, obtaining a passport or identity document, and assessing a tax relevant for the business activity) could become key inputs for monitoring the countries of the region.

Lastly, the Seminar revealed the complexity of the public sector and of the construction of indicators that combine international comparability, regional usefulness and national availability. This occurs where context indicators are crucial for the proper interpretation of data. These circumstances reflect the need to rethink the indicators applied today. Moreover, the government-government interaction becomes more relevant since the participation of public institutions in the life of citizens is such that progress towards a better government without measuring progress or the backward conditions in the use of back-office technologies cannot be analyzed (remember, for instance, the impact of health and education public services and the design, implementation and monitoring of public policies).

Evidently, the measuring of the transition to e-Government also calls for a structure that takes into consideration the context prevailing in the region and the particular circumstances of the national strategy (see Box 1). Given that there is vast information on the most traditional issues of the economic, political and social arena, the key to homogenisation is very likely to be found in the search for consensus regarding the set of indicators to be used rather than the definition of new indicators. Furthermore, given the existence of successful cases of ICTs implementation in some government sectors and activities, the identification and characterisation of these cases could clarify the most relevant indicators for monitoring the transition of Ibero-American governments to the KS.

Box 1: Application of e-Government Indicators

Salvador Estrada*

The ICTs may be a useful tool for the modernisation of the States. The implementation of a regulatory and legal framework allows to direct the activities, outline a series of initiatives to foster their extended use in addition to consolidating demand and the development of a series of specific applications for substantives and operational government tasks, the –provision of services and incorporation of citizens to public affairs.

There are no universally-accepted indicators or accurate statistics to evaluate the performance of governments as users of ICTs. The developed measuring and methodologies are based on

Table 2.1. Dimensions of Performance of Governments and Contribution to the KS

	AR	BR	CH	CO	ME	VE	LA
Vote and Social Accounting	57	60	77	39	49	31	52
Political Stability	50	37	66	8	26	12	37
Government Efficacy	52	53	86	58	60	17	44
Regulatory Quality	22	53	91	59	64	5	46
Rule of Law	39	43	88	36	34	3	34
Corruption Control	44	52	90	50	49	10	44
INFRAESTRUCTURE(1)	24	21	26	17	19	19	22
CAPABILITIES(2)	66	58	63	49	48	50	55
EFFORTS(3)	32	31	35	28	37	24	31
APPLICATIONS(4)	55	60	56	55	70	46	57

References: AR: Argentina, BR: Brazil, CH: Chile, CO: Colombia, ME: Mexico, VE: Venezuela, LA: Latin America. (1) E-GRI = E-Government Index, TELECOM = related to the telecommunications infrastructure sub-index , (2) Education and Human Resources =Related to the Education and Human Resources sub-index, KEI = Knowledge Economy Index, (3) Government Usage = Related to governmnet services available online and the volume and regulations on network transaction; and (4) NRI= Networked Readiness Index, Web Measure Index = Related to a measure of the interactivity degree of services from 0 – nil interactivity to 1 – full interactivity.
Source: WB (2008) and prepared based on E-GRI (2008), KEI (2008), NRI (2003-2004).

the assumption that the conduct of governments is reflected in the regulatory framework, in the availability of infrastructures and the educational level of citizens. Furthermore, many of them expressly consider their contribution through a measure on the availability of online services associated with the local government and even consider the political environment (rule of law, transparency, efficacy, participation and audit).

Pursuant to the Lisbon Manual, an analytical framework is suggested to incorporate secondary sources to appraise the government's contribution to the KS, not only in fostering the use of ICTs but also regarding the characteristics inherent to the Government and the State. Such an approach allows to get a balanced perspective of the attempts for modernisation and the governments' aim to promote and acquire IT resources and skills.

The World Bank is working on a methodological proposal aimed at standardizing performance indicators. Similarly to KS metrics, performance is also measured through meta-indicators or complex indexes, which are built based on various concepts and approximate measures. They are construed pursuant to a 0 to 100 scale where the higher qualifications represent improved performance. The related information is included in charts 2.1. and 2.2.

Table 2.2. Relation between the Matrix and Dimensions of governmnet performance

	INFRAS-TRUCTURE	CAPABILITIES	EFFORTS	APPLICATIONS
Vote and social accounting	0.86	0.76	0.71	0.32
Political stability	0.97	0.88	0.62	0.15
Government efficacy	0.49	0.40	0.77	0.50
Regulatory quality	0.27	0.09	0.70	0.56
Rule of law	0.71	0.60	0.66	0.28
Corruption control	0.59	0.48	0.71	0.40

The charts reflect better evaluations for the indicators related to the activity of e-utilities and human capabilities that reflect the available education and human capital. As to material government, the highest valued attribute is Social Accounting and Vote, and the worst is the Rule of Law, while in e-Government the lowest valued attribute is effort, which reflects a relatively low number of online public services and transactions.

If we establish a relation between the performance indexes for the true government and those for e-Government, the true dimension best evaluated (social accounting) influences more the infrastructure, capabilities and efforts of e-Government, and additionally e-transactions and services efforts are influenced by social monitoring, government efficacy, regulatory quality and anti-corruption fight.

If we combine these constructions, we find that despite the fact that in LA the Rule of Law is an undervalued dimension, this has not prevented governments from fostering online utilities and transactions though it seems to affect the provision of educational services and connectivity infrastructure. A similar comment can be made regarding Political Stability. Then, compliance with the laws and violent or incopnstitutional means to fight for power seem to affect negatively the telecommunications infrastructure per capita and opportunities for access to education.

*Based on the document presented at the 4th Seminar on Knowledge Society Indicators.

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Chapter 3: ICT Access and Use by Households

Introduction

According to the matrix, the "households" row includes an organised group of persons connected by blood ties, sharing a common dwelling and taking a series of decisions not strictly based on economic criteria. In the transition towards Information Society, the use of Information and Communication Technologies provides families with access to a number of goods and services as well as with new ways of interaction and support for their daily activities.

In the case of families, measuring the penetration and use of new technologies is crucial. Firstly, because it provides a measure of the degree to which society as such is using or enjoying the advantages of the new means of communication, interaction and even consumption. Secondly, particularly for countries with a lower level of relative development, because the transition towards KS could also constitute an exclusion factor.

In recent years, just as the "e-" prefix has been added to old social areas and activities (e.g., e-health, e-education, e-government, e-commerce, etc.), so also has the "digital" attribute been added to old development problems, such as digital illiteracy, digital gap, digital exclusion, etc. Therefore, measuring this phenomenon constitutes a key input to designing, implementing and monitoring public policies.

For those actually inside the revolution implied in the transition to KS, measuring access to and use of ICTs makes it possible to describe an entirely new array of interaction, work and consumption practices, which in turn sheds light on the dynamics of the new society. With it, governments should also adjust the ways in which they interact with citizens, identify the new basic needs and improve living standards.

In spite of the importance of this phenomenon and even though the problems associated with connectivity (or lack of it) have long since been identified by governments and civil society organisations, in most countries of the region there are still no surveys on ICT use by households and, where they exist, changes in measurement methods hinder their intertemporal comparability (and all the more so international comparability).

The countries in the region are thus faced with the challenge of improving their statistical information systems so as to adapt to the new needs. In light of this, the recent international trends in the construction of ICT indicators were addressed during the 4th Seminar. Specifically, it was evidenced that, even though the lack of indicators prevents carrying out region-wide intertemporal analyses, the existing developments in other regions constitute a key input to catching up on indicators.

As discussed during the Seminar, form standardization (which obviously includes method standardization) seems scarcely feasible in the short term, particularly because, similar to e-government, national strategies are a key factor in generating this information. However, the experience of other countries would prevent common mistakes and learn good practices. In such a context, the region stands in a privileged position to develop a first minimum set of indicators which helps make headway in the long-term path of building consensus over the use of common methodological guidelines for building comparable indicators based on existing information and recommendations.

a. What is the "Households" Row?

Analysing transition to Information Society among households is the counterpart to analysing e-government, e-business and e-learning. It involves measuring the degree to which citizens, workers and consumers are trained in, or actually using, the new information and communication technologies. Therefore, the object of study of the "households" row is precisely the Information and Knowledge Society.

It seems widely admitted among political, journalistic, business and academic circles that the convergence of ICTs is bringing about significant social, and particularly economic, changes. Although still important, the consensus slackens when analysing the scale and impact of the phenomenon.

However, it is clear that any attempt to quantify this process of changes, this social phenomenon, requires the most precise possible definition, highlighting some of its key features. Without these basic elements, it is not feasible to establish the similarities to and differences from earlier stages, thus making it impossible to quantify the changes and their impact. Therefore, it is necessary to try to understand the meaning of the various terms referred to the process.

The answer to the question of "what to measure" in the case of households is extremely complex, or at least broad. The measurement of transition to KS among individuals should be as wide in scope as society itself. It should include information about access, use, skills and obstacles, and allow distinctions as to sex, age, socioeconomic status, education levels, geographic location and any other distinguishing feature of each of the individuals making up society as a collective.

In recent years, two methods for measuring this phenomenon have been consolidating: structure indicators and home surveys. The former set is probably the most widespread and comparable, basically because it draws information from transnational communication companies through companies' associations, notably the International Telecommunication Union (ITU), which has published information about landline and mobile telephony and the Internet for more than a decade.

The second set of indicators draws data from surveys on households, whose object of study is the family and/or individuals. In this case, the aim is to measure infrastructure availability and use characteristics. Basically, the surveys are aimed at capturing access levels and frequency and activities carried out through the new means of communication and information. It must be noted that, even though the core questions are the same throughout, this kind of survey requires regular updating to reflect rapidly changing dynamics in the sector in terms of skills, possible activities and infrastructure.

For the reality of developing countries, measuring the phenomenon also requires focusing on the obstacles faced by citizens in accessing this new form of society. In this sense, as a result of the diversity of realities (and problems) across countries, the range of obstacles goes from the most elementary (illiteracy, lack of electricity and costs –income levels) to those faced by the most developed countries (supply availability, safety of electronic means, regulatory framework).

In this context, the problems of the digital gap are added to the old problems of underdevelopment, and the setting of priorities creates a vicious circle where no progress is made towards the Knowledge Society because more important (or urgent) problems exist and significant issues cannot be solved because of technological backwardness. Even more so, the context and the purpose of the surveys on households eventually undermines the possibility of conducting surveys which help

improve public policies on ICT access and use. According to the examples provided by Angulo Martín et al. (2008), surveys that combine general questions about households with ICT-related questions are confronted with situations such as having to ask someone from a household with a monthly income below 30 dollars (which is not at all uncommon) whether they own a personal computer or have an Internet connection.

Thus, in reflecting about what to measure in the region, regard must be had to the fact that it is necessary to look for an explanation to the lack of access (beyond evident economic or educational problems) while at the same time describing those who do have access, so as to identify patterns and specificities so as to help promote a digital inclusion policy. It must be noted that, even in countries with a lower degree of relative development, there are social sectors with income levels (and therefore consumption levels) similar to those in countries with higher degrees of relative development. Among the latter, what to measure may be the same as in developed countries. Among the former, what to measure has to do with identifying the target population and characterizing it in terms of income and literacy and skill levels.

b. Why Measure the "Households" Row?

As discussed above, the available evidence increasingly supports the idea that the process is a heterogeneous one, determined by the combination of the existing features of the various regions and populations and their deliberate efforts to capitalise on the advantages and minimizing the negative aspects of the transformation underway.

It may thus be said that the development of Information Society in developed countries is not the same as in developing countries. Firstly, the key technologies are generally conceived and generated outside of the region, and technical developments in the field are not always aimed at addressing the limitations and problems affecting our environments.

At the same time, these new technologies open the way for bridging the technological gap based on participation in a dynamic market with low entry costs including software development, e-trade, and remote and real-time access to knowledge and information.

For all these purposes, society's transition to this new form of interaction involves the development of skills and access to the basic technologies which make it possible. Thus, computer education and universal connectivity become two key factors in making progress towards sustainable development. Thus, the answer to the question of why measure is evident: to know the reality in which an attempt to intervene is made.

Again according to Angulo Martín and González Hortelano (2008), the characteristics of Knowledge Society "have made it a socially and economically revolutionary phenomenon, so much so that the traditional political goals of welfare, full employment, economic goals, reduction in inequalities, etc., are now joined by two new goals which are highlighted in most of the political and economic platforms of our decision-makers: (a) the fight against computer illiteracy, involving not just classical illiteracy where people cannot read or write, but an effort towards further educating those people to connect to the Internet; and in this regard, (b) bridging the digital gap, i.e., getting that new knowledge spread evenly across the entire population, regardless of sex, age, place of residence or income level".

These new policy goals are combined in a heterogeneous reality such as that of Ibero-America. Indeed, the goals pursued by the indicator systems designed by the most developed countries probably do not match the needs or issues existing in the rest of

the world. For example, the e-Europe program indicators are aimed at assessing the progress and efficiency of the EU's policies in the field. In that regard, the e-Europe program assumes that the basis for a European Information Society already exist, and the focus of concern is placed on which ways or methods to use in order to catalyse the process.

Instead, in Latin America the process is different. These countries are still faced with the challenge of laying the foundations for the Information Society. Therefore, it seems more relevant to identify and knock down the barriers which keep most of the population from participating in this new social feature.

Bridging the domestic digital gap is a much more relevant issue in developing countries than in developed countries because of its scale and extent. Even more importantly, many of the factors which contribute to the gap are structural in nature, so the possibility of bridging it will require long-reaching, long-term measures. In this regard, generating and presenting data broken down into geographic areas and social groups is an inevitable requirement, as statistics for a country as a whole only account for the gap with the rest of the world but hide the profound differences existing within a society or territory.

Moreover, reflection on KS revitalises the debate over technology and development. Knowledge Society is based on the evolution and dissemination of ICTs. While these technologies constitute a powerful tool for integration, they generate the sheer exclusion of those who are unable to incorporate them. Scientific and technological development brings about progress but at the same time it can intensify the differences between those who have the required skills to use it and generate it and those who are excluded from its benefits. In the case of ICTs, this effect is reinforced by the marked reconfiguration of space that they produce. Their penetration in a territory or society may be highly concentrated, meaning that neighbouring areas or groups quickly develop very different potentialities and opportunities. This may bring about a sharp territorial or social break-up.

In order for transition to KS not to become a new feature of exclusion, identifying and characterizing the households row must also contribute to enhancing "digital inclusion". Similar to many other aspects of well-being, universal access should not be considered in isolation and, even though this issue will be resumed in a specific section (see Chapter 7), it must be noted here that it cannot be based on an isolated strategy for transition to KS. On the contrary, only if KS is seen as a broader phenomenon that goes beyond the mere use of ICTs will it be possible to conceive of these technologies as a means to improve society's well-being.

Paradoxically, in such a heterogeneous context, international comparability also becomes relevant. If countries go separate ways in creating a set of KS transition indicators, then comparisons and relative analysis can only be inter-temporal. In such a scenario, it would be possible to analyse the bridging of the domestic gap but not the degree of KS-related backwardness or relative development or the region's technological backwardness, which ultimately hinders development or the successful international insertion. For instance, there is profuse evidence pointing at the importance of domestic demand for the development of goods and services, which in turn are expected to be placed on the international market. The more sophisticated and dynamic domestic demand is, the higher the chances of businesses keeping up with businesses from developed countries.

On a different level, only if technological skills and the availability of infrastructure in the region stands on an equal footing with the most developed cases (whether limited by

country, region or sector) will citizens gain access to the highest potential of ITCs. In short, if Internet connection bandwith fails to meet international standards, the range of contents available through it is limited, and thus the "Internet connections" indicator would be telling little about Internet use.

In a few words, all the foregoing highlights the need to move on towards the development of indicators for the "households" row which permit international comparability while reflecting the heterogeneity existing both between countries and within each country.

c. How to Measure the "Households" Row?

Transition to Information Society among citizens is analysed by examining the penetration of new information and communication technologies in households and individuals. The goal is thus to analyse not only the ICTs' penetration level but also how they are used and the obstacles that hinder access to them by individuals.

A number of international organisations have been developing a set of indicators and methodological procedures in order to make headway towards a set of internationally comparable indicators. However, because of the existence of nation- and region-specific features, the idea is that the resulting proposal can be supplemented with specific indicators tailored to fit domestic needs.

As discussed in the following sections, the organisations responsible for generating statistical data and indicators –OECD, EUROSTAT, United Nations/ECLAC— take a "demand side" approach based on ICTs access and use by individuals.

For the households row, two sources of information are generally used: surveys to families carried out by the National Statistics Bureaus and the information generated by telecommunication companies and their regulatory bodies and trade chambers – generally known as infrastructure indicators.

As regards the surveys, even though the definition of "household" is similar in all countries, both the age group used for defining "individual" and the survey's unit of analysis differ. For example, while for OECD and EUROSTAT surveys are aimed at collecting information about each member of the household aggregate aged between 16 and 74, for other countries the reference age starts at 10 and the unit of analysis is only the household as an aggregate rather than each individual member.

Information from the second source is provided in aggregate form and is mainly based on statistical data on front-office technologies infrastructure and use. In this case, the ITU's accomplishments have led to a high degree of standardisation of indicators, which are currently available for countries in different regions and with varying development levels.[9]

The primary challenge in generating information on transition to KS in households is to make household surveys widespread. Indeed, not all the countries in the Ibero-American region use this type of survey and in most of those which do generate indicators, these arise from general (or regular) exercises aimed at collecting information about socio-economic conditions, which restricts the number of ITC-related questions that can be included.

Yet another major challenge is the standardisation of existing information. Even though OSILAC has made significant accomplishments in terms of generating consensus (in

[9] See, for example, http://www.itu.int/ITU-D/ICTEYE/Indicators/Indicators.aspx.

fact, in the countries where these exercises are carried out, indicators are comparable), indicators have not been updated as quickly as technologies. For instance, the options associated with the use of Internet do not include the download of contents, and in the case of mobile telephony the use of text messaging or browsing is not included. At any rate, the type of statistical information generated must keep up with the technological advances.

The relative outdatedness of the indicators in the region (even the lack of them) is linked to the fact that the region is made up by countries with varying levels of relative development. In this regard, it is evident that if the question of whether electric power is available must be asked (as is the case of many rural areas in Central America), asking about music or video download seems wrong. However, it is likewise true that in some countries and particularly in some regions within those countries, the degree of development is similar to that of more advanced countries, so it seems equally wrong not to ask about the use of more advanced technologies.

That is precisely why the question of how to measure admits several answers (depending on the characteristics of each country) and that the standardisation of indicators depends on the creation of a stratified set of indicators which, similar to the matrix, if applied in modules and in a flexible fashion, make it possible to compare the situation of countries both in general and in particular. Therefore, as each country and region within each country makes headway towards the implementation of ICTs, it is not necessary to re-discuss the minimum set but it will suffice to incorporate a new module to the surveys.

c.1. OECD

In order to analyse the degree of penetration of ICTs in households, OECD proposes two sets of indicators: those concerned with infrastructure at an aggregate level and those specifically aimed at measuring access to and use of those technologies by individuals.[10] Aware of the twofold need to reconcile indicators which allow for international comparability while serving as tools for monitoring and evaluating the various levels of transition to Information Society, the OECD proposes a minimum set of indicators and at the same time an extended set which allows countries with varying degrees of development to make headway in the analysis of specific aspects such as the domestic and foreign “digital gap”.

The two types of indicators are shown in the Guide to Measuring the Information Society, published in 2005 and revised in 2007 (OECD, 2007). This guide does not contain only the proposed indicators but it consists of a compilation of concepts, definitions, classifications and methods for measuring and analysing the KS. Between 2008 and 2009, the Guide has undergone further review —basically with regard to the classification of ICT goods— and the new edition is expected to be published towards the end of 2009.

Table 3.1 shows the set of infrastructure indicators. These are derived from the information provided by telecommunications companies and their regulatory bodies and other sources of information –such as Internet service providers and private sector statistical information providers. The latest review of the Guide adopts the definitions

[10] Strictly speaking, the only indicators proposed for the households row are those based on the recommendations for measuring KS in families and individuals (Chapter 6). Infrastructure indicators are treated separately (Chapter 3), as their scope is narrower. At any rate, since the common denominator of most of these indicators is population, they may be easily considered representative of the transition of society as a whole.

proposed and used by ITU (ITU, 2007), many of them developed jointly with the organisation.

In this regard, ITU publishes more than 40 indicators on infrastructure, of which OECD collects about ten. The 2007 revision basically maintains the indicators proposed in 2005, although it incorporates those where technological advances require updates or where the generation of information allows it to be spread. For example, the former include the transmission of multimedia data through a single network (third generation technologies), and the latter include the analysis of Internet traffic (by quantity and content). Naturally, indicators which have ceased to be relevant, such as waiting lists for the installation of landline telephone, have been removed.

Table 3.1.: OECD Key ICTs Indicators

Telephony
Number of land lines (per number of inhabitants)
Number of mobile lines (per number of inhabitants)
Telephone traffic (per number of minutes/calls)
Internet
Number of subscribers (per number of inhabitants) - By type of subscription (wireless, cable modem, etc.) - By bandwith (broad, narrow, Kb/s)
Exchange traffic
Spending / Investment in Infrastructure
Telecommunication services rates (Internet and Telephony)
Investment in utilities (spending of telecommunication companies on infrastructure expansion)

Source: OECD (2007)

As shown in the table above, the indicators focus on the telephony and Internet infrastructure and on access-related spending/investment. These three modules in turn break down into stock and flow indicators (quantities and investment/traffic), and the fact that the data are presented in relation with the population or the uniformity of measures (for example, the dollar cost of a three-minute local call at prime time) allows making international comparisons without any major changes. The results of some of the indicators shown can be found in Key ICT Indicators on OECD's Website,[11] where a compilation of 15 indicators including up-to-date information is published.

Although useful and accessible, the main problem with infrastructure indicators is that many of them refer to the total population, so they underestimate the results from countries with a relatively young population, which are generally developing countries.

The input for the second set of indicators, aimed at measuring ICTs access and use by individuals, comes from household surveys carried out by the National Statistical Offices. This set of indicators proposes specific individual classifications –for example, taking into account age groups, formal education levels, and the composition of the household aggregate–, reply categories and reference periods.

The model questionnaire proposed by OECD allows statisticians to calculate the indicators agreed pursuant the Partnership on Measuring Internet for Development (see section c.3 of this chapter), while at the same time extends the list further to new indicators on more complex Internet applications (such as music downloads and

[11] http://www.oecd.org/document/23/0,3343,en_2649_34449_33987543_1_1_1_1,00.html.

security methods). However, unlike the documents published in earlier years, the trend in ICTs analyses is to include more complex statistics and studies based on microdata, so the recommendations are focused on standardising questionnaires rather than indicators.

In this regard, the chapter on households in the Guide presented by OECD includes a model questionnaire and recommendations on breakdowns by age, qualification level (as a proxy for socioeconomic status), gender and location, target population, collection techniques and exercise frequency (Table 3.2.).

Table 3.2.: Survey on ICT Use in Households (OECD)

Methodological Recommendations	
About the method	
Collection techniques	Face-to-face interview is recommended, telephone interview is not recommended (*since it would bias the sample towards those who have telephones*).
Statistical unit	Households (and members in the 16-74 age range), selected randomly.
Frequency	Annual surveys are recommended.
Reference period	The last 3 and 12 months for general questions and weekly to less than monthly for frequency questions.
Classificatory variables	
Household	With/without children under 16 Number of members
Individual	Age ranges between 16 and 74 Education Employment status Gender

Source: OECD (2007)

The survey model is divided into two sections (i.e., households and individuals) where core questions and non-core questions are interspersed (similar to the division between minimal set and extended set of indicators), and consists of 25 questions, all of which are closed questions, except for some which provide the option “other” and a space to specify the reply. The questions included are summarised in Table 3.3, and the full questionnaire is available on the OECD’s website.

As shown in Table 3.3., in addition to the traditional questions on access and use, the questionnaire includes new options and questions regarding obstacles, which allows for more complex conclusions on the outcome than merely penetration rates. However, aside from classification and reply choices, the questions still ask about the three types of technology about which there has been a desire to generate indicators ever since the earliest concerns over transition to KS: computers, Internet and mobile telephony. This leaves out other kinds of electronic devices and applications, such as music players, game consoles, photographic cameras and the whole range of software that can be accessed with various technologies.

In addition, it is curious that security indicators have been excluded (except for one question on computer viruses and protection methods). In this regard, the Guide mentions the problem posed by asking persons without specific knowledge about issues that require technical knowledge. In this regard, if access to certain websites (banks in particular) depends on the assurances provided with regard to data security,

then that technical knowledge is a key factor determining use level, and therefore it should be measured.

Table 3.3.: Surveys on ICT Use in Households (OECD)

Questionnaire Structure		
Unit of analysis	Question block	Response options
Households	Personal computers	Access in the household
	Internet	Access, device, connection type
	Obstacles	Reasons for no Internet access in the households
Individuals	Personal computers	Access and frequency in the household
	Internet	Access, frequency, place of access, activities carried out (including multimedia and training activities).
	Internet	Use of advanced services (Internet telephoning, videoconferencing, uploading, entertainment, etc.)
	E-commerce	Frequency, Amounts involved, type of goods and location of provider.
	Obstacles to e-commerce	Reasons for not using e-commerce
	Mobile telephony	Access and activities carried out

Source: OECD (2007)

In the ministerial meeting held in Seoul in 2008 it was agreed that, in addition to continuing generating the agreed-upon indicators, progress should be made towards developing indicators that address the new issues and challenges posed by KS by the end of this decade and, particularly, the policies required to meet them should be supported. In this regard, it follows from the Seoul Declaration for the Future of the Internet Economy (OECD, 2008) that it will be necessary to have indicators which:

- ⇒ Account for digital convergence paths in connection with networks, devices, applications and services
- ⇒ Describe the developments in terms of creativity in Internet development, application and uses
- ⇒ Improve security and strengthen confidence in ICTs.

c.2. EUROPEAN UNION / EUROSTAT

In the case of the European Union, measuring the households row is at the core of the i2010 initiative, a plan for promoting the European KS, which proposes to "create a European information space, reinforce innovation and investments in ICTs research and promote inclusion, utilities and quality of life" (EC, 2005). Even though the households row would seem to contribute to measuring the last of these objectives, the various i2010 reports and documents state that those objectives are only feasible provided improvements are made in terms of access and use and, specifically, in the skills of individuals making up this Knowledge Society. It is thus understood that the third objective seeks to improve utilities so that these in turn contribute to improving the standard of living of all citizens (UE, 2008a).

Based on these objectives, the European Union sought to define a set of core indicators for measuring ICTs penetration in the member countries. For the households row, the benchmarking indicators are distributed among the three i2010 objectives and, similar to the OECD's recommendations, they come from two sources of information: telecommunication businesses and unions and households surveys. The first source

provides the so-called infrastructure indicators, and the second one yields the access and use indicators.

Infrastructure indicators actually measure the spread of the Internet, which is one of the goals of the program, as shown in Table 3.4. The i2010 benchmarking methodological guide presents a set of 5 indicators for regional comparison and provides recommendations regarding the gradual incorporation of new indicators, pursuant to the progress both in the plan and in the dynamics of statistical information generation. Therefore, the 2007 and 2008 reports (EC, 2007 and 2008a) incorporate new indicators for comparison.

As shown in the above-mentioned chart, the infrastructure indicators' focus on the Internet alone is due to the goal of creating a common European space. It is assumed that the initial requirement for this undertaking is the possibility to access the Internet and the convergence of the network in terms of connection type and bandwith. This makes the number of infrastructure indicators substantially lower than the number in other institutions' recommendations. However, owing to the developments in terms of networks in the region, these indicators are at the same time more complex than the traditional ones. For example, the benchmarking indicators do not include questions about Internet availability, regardless of the bandwith, but only includes broadband indicators.

Table 3.4.: Benchmarking i2010 – Broadband Usage (Eurostat)

Broadband
Coverage
Number of subscribers, classified by platform (DSL, cable, fiber optics, 3G, wireless connection).*
DSL coverage in rural areas.**
Speed and prices
Predominant speed: most widely used download rate in each of the member states.*
Number of subscribers, classified by speed, with the following thresholds: 256, 512, 1024 (kbp/s), 2 and 4 Mbp/s.
Installation cost and monthly rates.

* Indicator included in the 2008 survey. ** Indicator available since the 2008 survey. Source: EC (2006 and 2008a)

The survey on households is divided into 5 modules and, even though the questions and possible answers are essentially the same as those suggested in the questionnaire proposed by OECD, the structure of the questionnaire is different. Each year a certain aspect (module) of information society is investigated. Thus, computer literacy was studied in 2005; electronic administration was studied in 2006; and network security was studied in 2007. Table 3.5 shows that the 2008 survey is divided into a first module of questions aimed at households, and other four containing questions aimed at individuals: access to ICTs, computer use, Internet use, use of advanced services and e-commerce.

The framework for the benchmarking indicators (EC, 2006) sets out 2009 and 2010 as timeframes for generating and testing indicators associated with trust and security, respectively.

Table 3.5.: Surveys on ICT Usage in Households (Eurostat)

Statistical Unit	Questions	Reply Options
ICTs Access		
Households	Personal computers	Access in the household
	Internet	Access, device, type of connection.
	Obstacles	Reasons for no Internet access in the household, annually alternating with reasons for non-availability of broadband
Use of computers		
Individuals	Personal computers	Frequency (from annually to daily), activities and place of access
	PC use training courses	Date of last course taken
Use of Internet		
Individuals	Internet	Access, frequency (from annually to daily), place of access, access device, activities carried out (including multimedia and training)
Use of Advanced Services		
Individuals	Internet	Use of advanced services (Internet telephoning, videoconferencing, uploading, entertainment, etc.) and payment for services
	Mobile telephony	Access and activities carried out
E-Commerce		
Individuals	E-commerce	Frequency, amounts, type of goods and supplier's location

Source: EC (2008b)

There are no methodological differences between Eurostat and OECD. Eurostat's proposals consider as a statistical unit each of the individuals aged between 16 and 74 making up an individual home aggregate and, in view of the speed of changes regarding ICTs, Eurostat proposes that these indicators be generated annually. Even though the reference period covers 12 and 3 months prior to the time of the interview, some questions ask about the previous week. Distinctions as to age, sex and occupation may also be based on Eurostat's questionnaire, although in the benchmarking indicators the questions require aggregate information about the group of individuals as a whole, except for frequent Internet users.

In line with OECD as regards the benchmarking indicators, EUROSTAT proposes a set of indicators concerning access, frequency and use of Internet and computers. Even though the questionnaires are similar and will thus yield similar indicators, the i2010 goals focus attention on Internet access and use. Therefore, the indicators are centred on this technology (Table 3.6).

Table 3.6.: Benchmarking i2010 – (Eurostat)

ICTs Access and Use by Households and Individuals
Access to ICTs
% of households with an Internet connection*
% of households with a broadband connection*
% of households with an Internet connection, sorted by access device: PC, digital TV, mobile device (including all forms of mobile connection, handheld computers, 3G).
Places of access
% of individuals who have had access to the Internet in the last 3 months, classified by place of access (multiple choice): at home, at work, at educational institution and public access places.*
Use of advanced services
% of individuals using (regardless of place of access and means of connection) the Internet regularly (at least weekly). *
% of individuals who carried out specific activities online during the last 3 months, sorted by bandwidth, education, age and activities: sending or receiving e-mails, communicating via Internet, searching for information about goods and services, obtaining/receiving subscriptions online, using digital broadcast services, playing/downloading games/music, electronic banking, online buying and selling and education. *
Inclusion
Reasons for not having an Internet connection at home, annually alternating with Reasons for not having a broadband connection at home.
Employment and skills **
% of population with no/low/medium/high Internet and computer skills (Based on the following activities: copying or moving a file or folder, using copy and paste tools to duplicate or move information within a document, using basic arithmetic formulas in a spreadsheet, compressing files, connecting and installing new devices, writing a computer program using a specialised programming language, detecting and solving computer problems. The classification is thus: no skills: no activity; low skills: 1 or 2 activities; medium skills: 3 or 4 skills; high skills: 5 or 6 activities). This indicator is alternated annually with another skill-related indicator including: using a search engine to find information, sending e-mails with attachments (documents, pictures, etc.), participating in chat rooms, news groups and other online discussion for a, using Internet for telephoning, using peer-to-peer shared files to exchange movies, music, etc., and creating a website.
% of persons employed with ICTs user skills (Based on OECD's classification. Skilled users: advanced users + basic users. Advanced users: competent users of advanced, and often sector-specific, software tools. ICTs are not the main job but a tool. Basic users: competent users of generic tools (*e.g.* Word, Excel, Outlook, PowerPoint) needed for the information society, eGovernment and working life. Here too, ICTs are a tool, not the main job.)***
% of persons employed with specialist ICT skills (Based on OECD's classification. ICT Specialist: they have the ability to develop, operate and maintain ICT systems. ICT constitute the main part of their job – they develop and put in place the ICT tools for others.)***

* Indicator included in the 2008 survey. ** Indicator available from the 2008 survey. *** This information comes from the Workforce Survey.
Source: EC (2006 and 2008a)

Naturally, just as the questionnaires are similar, so also are their limitations. As discussed earlier, a primary issue is concerned with limiting ICTs to computers, Internet and mobile telephony. A second issue, in connection with their potential application to Ibero-America, is that the extension and complexity of the questions may conspire against the reliability of the results. Since the ITC-related questions are included in general gatherings of information (not constituting a survey per se), the amount of information requested bears an inverse relation to the quality of the answers obtained. In addition, owing to the lesser relative development of some of the countries of the region, it would be necessary to add reference questions (such as the availability of electric power) while reconsidering the more complex questions (downloading of audiovisual content), so that, if the Internet connection is low or the bandwith too narrow, then it is unlikely that activities requiring higher skills are carried out.

The above does not imply playing down the importance of these questions; on the contrary, in some part of the region they constitute key input for analysing part of

society in its transition to IS. Therefore, it will be necessary to consider the way to combine simplicity with complexity so that, using similar questionnaires, it is possible to cover the full range of possibilities offered by ICTs, also combining international comparability with local usefulness.

c.3.UNITED NATIONS / ECLAC / OSILAC

The list of indicators proposed by OSILAC emerges out of the Summary of Practices on Implementation of ITC-related Questions in Surveys in Households and Businesses (Olaya; 2007), which is an adaptation to Latin-America and the Caribbean of the set of recommendations in the document "Key Indicators of Information and Communication Technologies", which summarises the agreements of the Partnership (Partnership, 2005). Like OECD and Eurostat, OSILAC proposes a set of indicators combining the information generated by telecommunication companies and unions and the information from surveys on households.

The advantage of infrastructure indicators is their periodicity and the possibility of directly comparing them with the levels reached in developed countries. These indicators basically come from the information published by ITU, although, owing to the lower relative development of the region, only a reduced set of indicators is proposed, basically including those associated with the less complex and more widely known technologies (Table 3.7).

Table 3.7.: Key Indicators of ICT Infrastructure and Access (OSILAC)

Infrastructure, access and prices
Basic set
Land lines per 100 inhabitants.
Mobile telephony subscribers per 100 inhabitants.
Computers per 100 inhabitants.
Internet subscribers per 100 inhabitants.
Broadband subscribers per 100 inhabitants.
% of population covered by mobile telephony.
Internet access rates (20 hours per month) in dollars and as % of per capita income.
% of municipalities with Public Internet Access Centres per number of inhabitants (rural/urban)
Extended set
Radio sets per 100 inhabitants.
Television sets per 100 inhabitants.

Source: OSILAC (2005a)

With regard to the questions in the surveys on households, in 2005 a meeting was held by the Partnership on Measuring ICT for Development, which comprises not only the United Nations and ECLAC, but also such organisations as ITU, OECD and UNESCO. At the meeting, significant progress was made in terms of building a set of indicators that would enable international comparison of developed and developing countries. For this reason, in terms of proposed indicators, United Nations generally and ECLAC for Latin-America —specifically through OSILAC— promoted the standardisation of ICT indicators based on a set similar to that proposed by OECD and, to a lesser extent, to that proposed by Eurostat (OSILAC 2004, 2005b and 2005c).

During 2008, the Global Event on Measuring the Information Society took place, which was also organised by the Partnership. At the event, the lists of agreed indicators were discussed and updated. However, OSILAC's recommendations were still based on the

previous meetings, as the round of reviews and agreements had not yet finished by then.[12]

The list of indicators currently available results from the consensus reached in the 2005 meetings, which is currently under review. A revised list of indicators is expected for late 2009. This is due to the need to reflect the developments in the technologies — e.g., including the new activities among the Internet use options— while the indicators are standardised according to the Partnership's recommendations and OECD's and Eurostat's developments. In addition, owing to the advances in the national measuring systems, the distinction between core indicators and the extended set is supposed to be removed from future recommendations.[13]

Unlike in the European Union, there are no surveys specifically aimed at measuring ICTs in households. As discussed above, the currently existing data are the result of the initiative of some National Statistical Offices to include ITC-related questions in the regular surveys on households or in the censuses. Therefore, progress in developing a set of indicators for these countries implies reconciling the need for international comparability with national usefulness within a small set of questions.

In that regard, at the meeting held in Quito in May 2005 between UNESCO and ECLAC, the document "*Plan of Action for the Information Society in Latin America and the Caribbean (eLAC 2007)"* (ECLAC, 2005b) was discussed, which led to what was later called eLAC 2005, with goals for the 2005-2007 period. In 2008, in the II Ministerial Conference on the Information Society in Latin America and the Caribbean, the results from eLAC 2005 were discussed and the San Salvador Commitment was signed, based on which the following stage was set in motion: eLAC 2010. This plan "conceives Information and Communication Technologies (ICTs) as tools for economic development and social inclusion. It is a long-term strategy (aiming at 2015) in line with the Millennium Development Goals (MDG) and the World Summit on the Information Society (WSIS)" (ECLAC, 2008).

The main goal is to design and implement nation-wide strategies which in turn articulate with supra-national goals. That is, to marry the local features with a Latin-American plan that helps support local initiatives with a view to overcoming the region's long-standing challenges: "to build an integrating and development-oriented information society" (ECLAC, 2008).

Based on a meta-platform comprising public and private organizations alike, the dynamics of eLAC 2010 consists of developing a general strategy centred around 5 topics broken down into 18 objectively quantifiable goals and 65 action-oriented goals, pointing out concrete steps aimed at attaining them, which will later be supplemented on a national level with the respective local plans, according to each country's specific needs. The topics of the Plan are set out in Table 3.8.

[12] The proposal may be found at http://new.unctad.org/templates/Event____888.aspx.
[13] For further information, see the documents and presentations from the V Regional Workshop on Information Society Measurement in Latin America and the Caribbean, at www.eclac.org/SocInfo/OSILAC/.

Table 3.8.: eLAC 2010

Action Plan Topic Areas
1. Education and training
2. Access and infrastructure
3. Health
4. Public Administration and E-government
5. Productive Sector and E-business
6. Policy instruments and strategies

Source: CEPAL (2008)

As regards the relation between ICTs and the eLAC action plan, the San Salvador Commitment sets the priorities regarding environment, access, skills, applications and contents. Thus, for each of these goals and measures, deadlines were set ranging from 2008 to 2010, although the general strategy has a 2015 horizon (so its review is expected for 2010). Even though most of the Plan's goals are not associated with numeric indicators —particularly owing to the scarce statistical information generated nationwide on this issue—, OSILAC is the organisation in charge of monitoring it, and the proposed indicators are set along those lines.

Such is the goal of the indicators proposed by OSILAC, which were agreed upon during 2005 and are still in force.[14] As explained earlier, the indicators are the same as those agreed upon within the Partnership. The questions aimed at surveying information, shown in Table 3.9, were developed based on such indicators as a guideline. On the other hand, because the existing information stems from specific initiatives carried out by the NSOs, it reflects different methodologies. Therefore, the proposal also aims at achieving a common methodology in all countries of the region which makes it possible to monitor eLAC.

As shown in Table 3.9, indicators of access to radio, television and landline telephone constitute key reference indicators. Then, on a higher complexity level (with respect to the region), OSILAC proposes indicators of infrastructure and access to computers and the Internet. The breakdown of activities is similar to that formerly used by the European Union, focusing on the most widespread services and activities (electronic banking, e-mail, and information searching).

[14] Even though the need to complex ICT indicators was discussed at the El Salvador meeting, there is still no new set accepted by the various countries of the region.

Table 3.9. Key Indicators of ITC Access and Use by Households (OSILAC)

ITC access and use by households and individuals
Basic set
% of households with a radio set.
% of households with a TV set.
% of households with a landline telephone.
% of households with a mobile telephone.
% of households with a computer.
% of individuals who used a computer in any place in the last 12 months.
% of households with Internet access.
% of individuals who used Internet in any place in the last 12 months.
Place of Internet use in the last 12 months. (Classification: home, work, educational institution, free public access centres, paid public access centres, someone else's house, others).
% of individuals who have carried out certain activities on the Internet in the last 12 months. (Classification: obtaining information —products and services, health, government entities, others—, communication, buying products or services, electronic banking, education and learning, transactions with government entities, entertainment —playing/downloading games; obtaining films, music or software; reading/downloading newspapers or books; others).
Extended set
% of individuals using a mobile telephone.
% of households with Internet access, by type of access (at least broadband and narrowband).
Frequency of access to Internet by individuals in the last 12 months (in any place). (Classification: at least daily, at least weekly, at least monthly, less than monthly, doesn't know).
Reference indicator
% of households with electric power.

Source: OSILAC (2005a)

Similar to OECD, OSILAC also distinguishes the basic set of indicators from the extended set, although, as is expected, the number of indicators in both sets is significantly lower. Substantial progress has been made towards eliminating the distinction between basic indicators and the extended set since the last Partnership conferences held between 2008 and 2009.

Differences in methodology still persist between the NSOs of different countries. One of them is the unit of analysis. As mentioned in the introduction, while in some countries the surveys on households collect information about all the members of a given household aggregate, in others only a representative answers the questionnaire. Therefore, replies may vary substantially depending on the characteristics of the person answering.

A second difference is the reference period used. While in developed countries questions are already being asked about the use of ICTs in the last three months, OSILAC's recommendations take the last year as reference period.

Another difference concerns the possibility of establishing breakdowns based on age, qualifications, socioeconomic status, place of residence and gender. This is probably the aspect which will require the most stringent efforts towards standardisation and which poses, in some cases, insurmountable obstacles. Since in some countries the unit of analysis is the household, many distinctions become blurred. At the same time, although the age of the surveyed persons can be estimated, the ranges used by each country vary, which hinders OSILAC's collection of indicators. Another issue concerns the lack of standardisation of the countries' statistical systems. While in the European Union it is possible to set up complex indicators combining different surveys (for example, combining the ICTs survey with the workforce survey), in some countries of the region, although it is technically possible, there are no institutional agreements

required to put it in practice. In other countries, there is no such information at all (for example, in some surveys the unit of analysis is exclusively the urban population).

Finally, the last substantial difference between OSILAC and institutions such as OECD or Eurostat concerns the degree of development of comparable statistical systems. Since there is no supranational organisation developing methodological plans for the region's NSOs, OSILAC's achievements are the result of a search for consensus and therefore take longer to be put in practice than recommendations from organisations such as Eurostat. For this reason, while achievements have been made in developed countries since the first edition of the Lisbon Manual in terms of improving indicators, updating them to reflect technological advances and deepening theoretical and methodological approaches, OSILAC's efforts have focused on the passage from the form proposal to effective measurement in each country.

In this regard, efforts were successful. By 2007, over 18 countries of Latin-America and the Caribbean were generating almost all the agreed-upon indicators and in 2008 the ITC Statistical System was put in place, consisting of an online record of indicators based on surveys on ICT access and use by households.[15] The system, presented at the Statistical Conference of the Americas 2007, provides access to ITCs statistics about individuals in around 16 countries with up-to-date information.

The IV Workshop on Information Society Measurement in Latin America and the Caribbean, held in 2008, marked a step forward toward standardising methodological guidelines, particularly age ranges and target population, where age ranges similar to those used in developed countries and common minimum and maximum ages (from 16 to 74) were agreed. Of course, this does not prevent some countries from choosing different ranges and then presenting indicators with the agreed-upon parameters.

Another issue agreed upon during the Workshop was the creation of specific work teams made up of representatives from NSOs and various institutions associated with measuring KS, in order to help improve the proposed indicators to adapt them to the requirements of such a dynamic phenomenon. The advantage of this work plan is that it simultaneously promotes the creation of indicators and consensus based on the discussions and outcomes of previous workshops (OSILAC, 2008a and 2008b). Thus, it is expected that in future workshops the achievements made by each group will be presented and an agreement is reached as to the steps to be made in terms of regional measurements.

d. Towards a Strategy for Analysing the Households Row for Ibero-America

d.1. The Need to Take a Comprehensive Approach

Based on the foregoing, it becomes clear that the various theoretical approaches to KS and the consequently diverse goals of the organisations' measurement proposals may be grouped into three positions.

Firstly, the different development levels of the European region vis-à-vis the average development level in Ibero-America. In Europe, Eurostat's proposals are designed to contribute to measuring the progress of i2010 and therefore the set of indicators becomes increasingly complex as the proposed goals are reached. Thus, the degree of sophistication of activities surveyed is far from being similar, or even relevant, for countries with a lower relative development.

OSILAC's efforts focus less on monitoring eLAC than on standardising indicators (see Box 2). Therefore, while in recent years the efforts of Eurostat and specialised groups focused on improving the existing information, for the countries of the region efforts

[15] http://www.cepal.org/tic/flash/

centred on generating it.

The international comparison sought in the region also allows a second goal: the digital divide. Measurement efforts were simultaneous with the implementation of a number of policies aimed at achieving universal connectivity. These policies, with varying degrees of success, have constituted a major step forward in the direction of digital inclusion, although in view of the available statistical information, there is still a long way ahead. Strictly speaking, if the region kept up with the advances made in the more developed countries, then the indicators created by the latter should be similar to those needed by Ibero-America.

Therefore, it is worth asking about those indicators which are not relevant. If the most basic access and use indicators are required for designing and implementing public policies, then it is accepted that the region —i.e., the countries in it— will or should make progress in a linear fashion and that having those indicators will be useful only as long as universal connectivity is achieved —regardless of access devices, connection speed or frequency of use.

On the face of it, the above statement seems to be true, and any other alternative would apparently violate logic. It is of little use to ask about the download of contents if there is no Internet access. However, if looked in light of technological developments, it would be of little avail (as a measurement of development) to achieve universal connectivity if it comes in the form of narrowband connection or dial-up technology. This means that the States of the region face the twofold challenge of achieving universal connectivity but taking into account its characteristics in line with technological advances. Thus, the problem is that, as technology advances, the technological leap which the region is faced with is so much longer.

In terms of indicators, this has many implications. Firstly, simpler indicators are extremely useful to measure the domestic divide and to achieve a minimum common denominator that will provide a basis upon which to produce a more complex set. Simpler indicators are even more useful if they serve to lay the basis for the ICTs statistics system. However, in the more developed areas of the countries in the region, it is likely that indicators reach levels close to 100%. An indicator with such reply levels is as little useful as one yielding levels close to zero. Therefore, regional segmenting seems to be an unavoidable requirement for statistical offices and policy-makers alike.

Secondly, these indicators are not sufficient to account for the external gap. It is useless to know the degree of Internet penetration versus European levels if connection speed in the region is such that will not allow more complex software-related activities which require higher data transfer rates.

Thirdly, the countries of the region should improve their statistical information system, and this requires practice both by NSOs and by individuals answering the surveys. For this reason, while for countries which already have ICT-related surveys or modules maybe it is convenient to aim at more complex questions, for those which do not yet generate that information, the minimum set would be enough to practice data collection.

In sum, despite the fact that the households row has long been measured (in comparison with other rows), it has not yet reached the indicator standardisation level needed to move further towards more complex measurements. This results in recommendations being based on simple, limited and general indicators, not because they are the best but because they are the possible ones. The problem with this

approach is that the search for comparability reduces usefulness, which in turn leads back to the question of what to measure.

International comparability is clearly a key requirement for KS indicators, but this should not be so at the expense of domestic usefulness. Indicators are means rather than ends, and with that in mind any minimum set should be agreed upon. The challenge ahead is more likely to lie with the search for common ground in national strategies and, based on these, the creation of comparable indicators than with establishing a minimum set which, although perfectly comparable, tells little about the distance between technological dynamics, its potential to improve living conditions, its usefulness as an information and communication tool and the way in which individuals take advantage of the benefits of ICTs.

d.2. Thoughts and Achievements of the IV Seminar

During the Seminar, participants discussed the limitations and advantages of the minimum set proposed by OSILAC, which is the most highly standardised set of indicators in the region. Clearly, this organisation has made no minor efforts and any attempt to look for the minimum set in another set of recommendations would only lead to duplicating efforts. After all, OSILAC's recommendations are in keeping with those of OECD and Eurostat's, and that is partly the outcome of the work made by the Partnership on Measuring ICT for Development.[16]

The following discussion of the set of indicators takes into account the proposal put forward by Angulo Martín and González Hortelano (2008) during the IV Seminar and seeks to help lay the foundations for statistics generation dynamics which makes it possible to follow up on KS while at the same time allows international comparability. Similarly, the purpose of this plan is to provide a better answer to the question regarding transition to Knowledge Society among individuals, minimising the availability of necessary information.

The first issue in connection with the proposed model is the lower importance ascribed to the indicators which are irrelevant for measuring KS, even though they might be of considerable importance for countries with a lower relative development. These are the so-called "reference" indicators: availability of radio sets, TV sets, landline telephone and electric power.

A similar thing happens with mobile telephony, but not because of availability but because of usage. Asking about the proportion of households with this technology says little about how it is used, so this indicator loses relevance. Furthermore, this is an individual rather than group technology, so the "household" aggregate would not correspond with the type of ICT. Therefore, it would seem more convenient to focus on usage although, of course, for some countries measuring it continues to be relevant.

Among priority indicators is Internet access and use (further breaking down into frequency, place of access and bandwidth). Owing to the developments in ICTs, these indicators constitute key reference parameters. However, as rates stand close to 100% they will need to become more complex. In other words, even though they are relevant indicators, they fail to account for the digital gap since the technological frontier has shifted towards new Internet forms, speeds and applications and towards new access devices. Therefore, a crucial first step is to know the degree of penetration and the

[16] It is also worth mentioning ITU's recent publication on measuring ICTs in households (ITU, 2009), which is also in keeping with the Partnership's recommendations.

bandwidth so as to outline not only how much people access the Internet but also how far behind the region is with respect to speed.

Another issue related to these indicators is frequency. It would seem inappropriate to measure the rate of use or access based on the last year as a reference period. Given the intent of these indicators (i.e., knowing the degree to which societies move towards KS), a person who used a computer or connected to the Internet once or twice in the last year should not be considered a digital citizen, nor should they count towards the penetration rates. Clearly, a low usage rate reflects a low level of access to these technologies (because of lack of skills, resources or interest). On the other hand, owing to the progress shown by indicators in more developed countries, not reducing the reference period would undermine the indicator's comparability, which gave rise to it.

In this regard, key indicators are those which inquire about the availability of technologies in the household. The fact that a household has a computer with an Internet connection will likely reflect a more intensive use, at least by one of the family members. This also accounts for the access possibilities and the measure to which ICTs are incorporated into individual's habits. Of course, this indicator should be paired with those which inquire about obstacles so as to fully understand the resulting rate of penetration.

The place of access is a relevant indicator for countries which seek to assess public access policies and the potential range of regular users that could be achieved if policies aimed at acquiring equipment were generated. It also makes it possible to know the places in which individuals acquire ICT skills (assuming that usage leads to learning), which would constitute a key input for understanding how certain places contribute to the transition to KS. Such is the case, for example, of ICT use at the workplace. At any rate, this indicator could be regarded as having a lower hierarchy than the others.

The type of activities carried out through the Internet is another indicator which needs further precision. In countries where the Internet is more widespread, it would be important to know these data, but perhaps incorporating more complex activities and services (such as those recommended by OECD). In countries where Internet penetration is lower, the relevance of this indicator declines, but not because of its importance in absolute terms but because of the statistical relevance of the rates it can yield. The greatest problem occurs in those countries with marked development disparities (basically all), where extreme poverty areas coexist with social strata with consumption standards close to those of developed countries. In these cases, this indicator would make it possible to analyse the conduct of strata with ITC access, but in light of the percentage of population for which the indicator is relevant. Therefore, this indicator would stand second in importance with regard to the minimum set to be published, and the priority afforded it in each country's ICTs statistical system will depend on their specific situation.

A hardly widespread indicator in the region is the one measuring costs (proposed indicators within OSILAC's basic set). In this regard, as technology spreads, costs decline and affordability increases (regardless of a better or worse distribution of income). Therefore, it would be useful to include this kind of indicators, which could also be obtained from sources other than surveys to individuals, such as price surveys (for computer prices) and information provided by telecommunication companies (for Internet access prices).

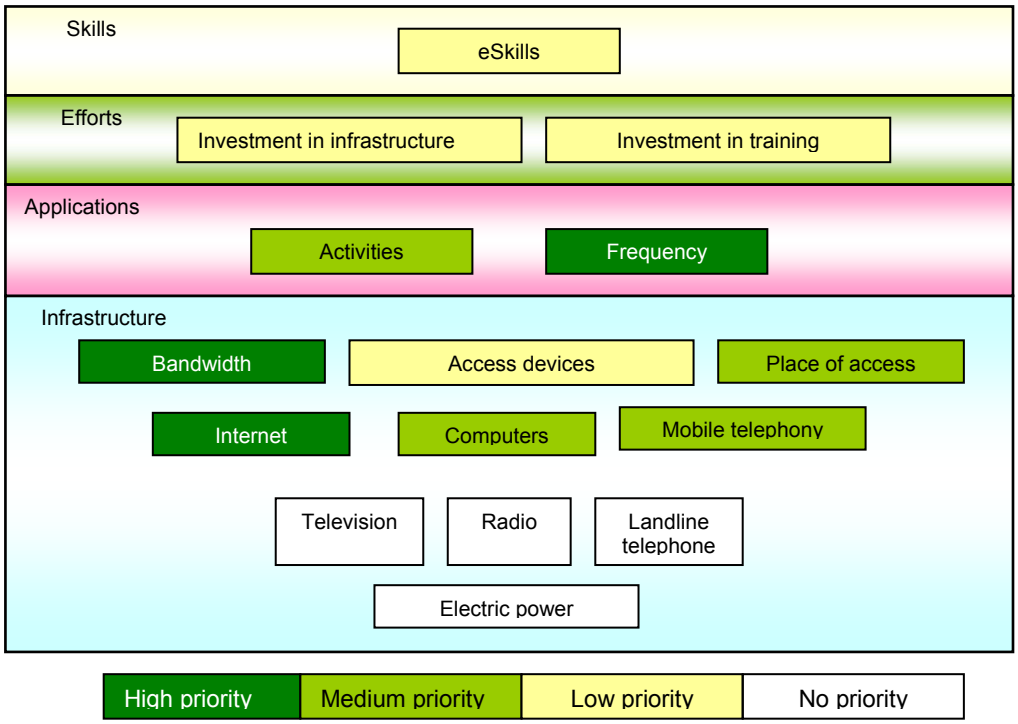
As regards the latter source of information, a number of organisations generate and publicise a large number of indicators annually. However, these indicators are

infrastructure indicators which, in relation to the total population, do not allow for further analysis or even less any further breakdown. In this sense, even though monitoring this information is important, in no way could this source substitute for the surveys on households and families.

Another set of less widespread indicators is that associated with ICT skills (eSkills). Unlike in the European Union, where there already are questions and indicators aimed at monitoring the development of skills of users and ICT specialists, there has been little progress in the region in that regard —probably because less than enough progress has been made in terms of more basic indicators. With regard to the model proposed here, even though its priority in connection with the KS is high, it is unlikely that it will be implemented in the short term, which affords it a lower hierarchy in relation with key indicators, but makes it a short to mid-term goal.

Figure 3.1 attempts to summarise the above discussion in light of the methodological recommendations based on the Matrix presented in Chapter 1. As shown in the Figure, owing to the region's disparities with regard to transition to KS and, particularly, the disparities existing within each country, it is necessary to conceive a system of indicators which combines more complex measures with more simpler ones. Even though it is not to be expected that the various levels of complexity will be achieved immediately (in fact, for some regions it would be irrelevant), a system which allows for the gradual incorporation of more complex indicators is in effect necessary. Otherwise, if there is no general agreement as regards the model, when the desired level of standardisation is reached, even though we will be able to compare Ibero-America, the differences with the more complex measurement systems will call for new agreements, which will again push the region backwards in terms of statistical information.

Figure 3.1.: Proposed Priorities for Indicators in the Households Row



Source: designed based on Angulo Martín and González Hortelano (2008).

In this regard, looking at the progress made by developed countries does not imply accepting that the countries of the region must follow a similar path. On the contrary, the speed of technical change forces us to move discontinually, to "leap" between

technologies because the decline in costs allows for migration between technologies not to occur in a linear fashion.

However, even departing from Rostow's stage-based progress theories, there is no denying that the generators of new ICTs are the developed countries, and it is also in those countries that ICTs spread most rapidly. Therefore, even though some issues require local treatment (for example, access to e-health will depend both on developments being made by governments and on the particular features of e-health in each country), there is no doubt that the evolution of indicators in relation to technological dynamics will by partly seen in the information considered relevant by developed countries.

At the same time, and according to Angulo Martín and González Hortelano (2008), the possibility of developing in stages allows us to learn from the mistakes and successes of developed countries.

To make ICT indicators more complex, we should not look up to, for example, European benchmarking indicators. On the contrary, based on the basic set currently available in the region, it is possible to start thinking of a complex set which combines indicators shared by developed countries, regional indicators according to the region's average development status and national indicators, in line with the strategy for transition towards the Information and Knowledge Society.

Box 2: Measuring ICT Access and Use in Households: Delay with Advantages

Carlos Angulo Martín and Antonio González Hortelano*

To obtain ICT indicators in Latin-American households, OSILAC has promoted the collection of data as a module of the general households surveys regularly conducted in the region. This poses a number of problems including space constraints in the questionnaire and the varying methodologies of surveys on households (goals, scope, classification aggregations, sample sizes, etc). Added to this is the scarce experience (except for Mexico) in measuring ICTs and the low level of ICTs access and use by individuals and households. Table 3.1 below provides an example of the latter two.

However, this scenario also has a number of advantages. Firstly, the questionnaire and indicators are already harmonised. Secondly, the module is less costly and guarantees that indicators will be obtained annually. Thirdly, there is an opportunity to avoid making the same mistakes made by other more developed countries in measuring ICT, and in drawing on the experience in good practices in implementing policies promoting KS, because it is possible to learn from the mistakes of others as much as from their successes.

Finally, the existence of the *eLAC 2010 Action Plan* for the 2008-2010 period, which is a follow-up to the *eLAC 2007 Plan* and emerged from a ministerial agreement among all countries of Latin America and the Caribbean, with its significance, underpins the financial pillar on which the preparation of indicators to monitor these public policies must stand.

Indeed, collaborative policies coordinated among the various participating countries are uncommon in the region, which shows the governments' interest in catching the digital train.

This extraordinary situation means that sources of financing will be available not only to support public policies promoting the development of Information Society in Latin America, but also to monitor and follow up on these public policies by preparing indicators of the evolution of ICTs in the region's households.

Table 3.1. Proportion of individuals who used the Internet in the last 3 months (or 12 months).

	Age of Target Population	2005	2006	2007
Brazil	>= 10 years	24	28	34
Colombia				33
Costa Rica	>= 5 years	20		
Cuba	> 5 y < 65 years		24	
Dominican Rep.	>= 12 years		16	
Ecuador			7	
Honduras	>= 15 years		15	10
Mexico	>= 6 years	18	20	22
Panama	>= 15 years		22	
Paraguay	>= 10 years		8	
Peru				29
Uruguay	>= 6 years		29	
Portugal	>=16 an4	32	36	40
Spain		44	48	52

Sources*OSILAC, CETIC from Brasil, DANE from Colombia, INEC from Ecuador,INE from Honduras (2007), INEGI from Mexico, INEI from Peru and EUROSTAT (Portugal and Spain). There is no available information about the rest of Latin-American countries.*

(1)Timeframe used in most of the data: : in the last 12 months,
Brazil, Honduras, Portugal and Spain (last 3 months) and Mexico (last 6 months)

Therefore, in spite of the problems in the preparation of ICT indicators in Latin-American households, such and so many advantages are converging in this particular moment and in this particular economic and social field, such as the development of Information Society by the end of the 2000s, that we simply cannot miss the opportunities currently given by societies in general and governments in particular to Latin-American statisticians and researchers.

* INE (Spain). Based on the paper presented by the authors at the IV Seminar for Knowledge Society Indicators held in Lisbon (2008).

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Chapter 4: ICT Access and Use by Businesses

Introduction

According to the matrix, the "businesses" row includes all organizations that are profit-driven and use a cost-benefit approach to decision-making.

In general terms, measuring the level of ICT penetration and use by businesses involves not only measuring the way in which and the intensity with which these technologies have penetrated the front office of these organizations but also analyzing the impact, in terms of efficiency, of the introduction of support technologies into critical activities commonly referred to as back-office.

Over the past years, there has been some progress towards consensus on the importance of measuring the transition to the Information Society (IS) by businesses. However, no such progress has been made with regard to the effective development of indicators to monitor such process.

In contrast to the measurement of the level of penetration among households or the government, the businesses row is perhaps the area where most progress has been made in terms of measurement of the KS. However, such progress has been more the result of the search for common indicators or standardised statistics than the creation of a body of information capable of explaining the extent to which these technologies help enhance private returns as well as spillovers to the rest of society.

Therefore, this chapter aims to contribute to the creation of an analysis scheme which, by combining data availability, international comparability and national relevance, will help analyse, in a comprehensive manner, the transition of businesses to the Information and Knowledge Society.

a. What is the "Businesses" Row?

In order to measure the transition process to the Information Society by businesses, it is necessary to capture data concerning ICT infrastructure and use as well as the skills available to take advantage of information and knowledge flows (Baptista, 2005). In this connection, measuring the "businesses" row implies capturing the extent to which ICTs help businesses improve performance. Therefore, despite the initial assumption that implementation of new technologies improves business performance, given the wide range of other factors also at work, it is not possible to consider only input measures. Once the "black box" approach is abandoned, process measurement becomes relevant.

If a business is a collection of more or less repetitive processes, then ICT adoption may be understood based on its use as a support tool for the different types of work routines within an organization. Thus, within a business there are standard operating procedures —repeated actions associated with the organization's core operation—, strategic decision processes —those related to growth and expansion plans— and processes related to the search for technological and organizational improvements which, given their impact on standard operating procedures, are associated with a specific type of competitive strategy (Peirano and Suarez, 2005a).

If ICTs may be implemented in any of the routines of a business and even though it is possible to find different levels of technological requirements in all of them, it is clear that the more repetitive and standardised the routine is, the less complex automation and computerization will be.

Performance improvement through ICTs, once the stage of computerization of support processes (information) and coordination of different areas (communication) is completed, depends on the level of progress in introducing ICT tools as support for all types of routines in the organization and the degree of success in implementing organizational innovations to maximise the use of these tools. Therefore, the analysis of the transition of businesses to the Information Society implies going beyond the implementation of front-office technologies and defining the key aspects associated with the back office. This is so because the main impact of ICTs, once the first computerization stage is completed, is associated with their potential for improving the efficiency of an organization's critical processes and the availability of the minimum skills required to integrate them.

The foregoing implies that the measurement of the transition of businesses to the KS goes beyond e-commerce and e-business (which, although relevant, do not exhaust the potentialities of ICTs). Stock indicators (infrastructure), though readily quantifiable and comparable, do not help to capture the complexity of a key factor underpinning development. Certainly, any approach to the phenomenon of business dynamics that is based on a single set of indicators will not be capable of explaining it (even if detailed surveys are conducted); however, if ICT implementation is understood (and measured) within the framework of a broader approach, the contribution to this explanation will be of better service to both policy makers and businessmen (which, in turn, will make the difficult task of collecting data much easier).

In this regard, over the past years important contributions have been made to the conceptualization of ICT impact on businesses so as to develop a theoretical structure capable of explaining the relationship between these technologies and increases in productivity, within the framework of a genuine competitive strategy.

b. Why Measure the "Businesses" Row?

In the past few years, there has been significant progress in methodological developments associated with the measurement of ICT penetration and use by businesses, which were developed in parallel with the creation of consensus on the necessary key indicators to make regional and international comparisons. The reason for this is that ICT measurement in businesses (together with innovation, in a broad sense) in addition to helping identify and analyse economic progress through ICTs, makes it possible to research and analyse, between and within countries, issues related to the industrial sector and the way in which this sector accommodates itself to the new world dynamics.

The different ways of measuring ICT penetration in businesses have been the result of the evolutionary nature ascribed to ICT impact over time. At first, the focus of attention was placed on the ICT production sector. However, in time the importance of the demand for these technologies became apparent. At present, it could be said that this type of measurement is understood as a way of advancing our understanding of the factors that determine the competitiveness and technological development of businesses as well as the impact on a country's economy.

As a result of the different national strategies and the plans and programs that were implemented accordingly, the availability of information regarding ICT implementation made it possible to use this information for assessing and monitoring policy development. Organizations such as OECD and EUROSTAT have developed extensive pioneering work aimed at promoting, monitoring and assessing economic growth policies; that is, providing information to political decision-makers to formulate and implement socio-economic development policies.

More recently, the United Nations, in general, and ECLAC for Latin American countries, are heading in the same direction, proposing indicators that can be used not only for analysing the situation and evolution in Latin America, but also for comparison with developed countries. However, for developing countries, which are not yet as advanced in terms of ICT adoption or measurement, the development of a set of indicators helps analyse ICT penetration in businesses and, at the same time, serves as raw material for the formulation of public policies that promote the use of these technologies, which in turn foster economic growth.

In this respect, ICT implementation would be associated with the search for productivity improvements (when they are incorporated into the production process) and organizational improvements (when they are used to support management, organizational and marketing activities). This means that ICT implementation is not separated from an organization's innovative efforts; on the contrary, these technologies are a form of innovation. Then, if ICTs are understood as a dimension of the strategic goals of a business, their measurement would help identify successful track records and, based on them, the key elements for developing policies capable of reproducing those results.

c. How to Measure the "Businesses" Row?

The ICT approach within the competitive strategy of a business as well as the interest of statistics users in knowing the rate of return on these investments leads to consider both the implementation process as well as the outcome. Therefore, impact indicators are as important as input indicators; otherwise it would not be possible to identify differential paths. With respect to impact indicators, there is a long-standing statistical tradition associated with the outputs of investment processes (generally, through sales, exports, employment, or any combination of these). However, if the introduction of these technologies is part of a wider strategy for improvement, its impact is determined by several factors and it would therefore be a mistake to ascribe performance improvement exclusively to ICTs.[17]

In addition to the difficulty in isolating the impact of ICTs on the evolution of performance, there are also problems resulting from the time lag. Although it is reasonable to expect investment in ICTs to have a shorter-term impact —as compared with other investments—, it is difficult to assume that investments can be capitalised and amortised in the same period they were made. As a result, analysing investments and impact requires time series data to at least be able to compare both variables with some time lag.

Another issue related to ICT measurement is associated with the acknowledgment that there is more to ICT implementation than the introduction of software and hardware. It is therefore essential to redefine the "ICT investment" variable and include the variables related to use in the analysis. The high level of Internet penetration in businesses shows the lack of explanatory power of the traditional "web presence" variable if it is not analysed in combination with indicators relating to activities that can be carried out online. Something similar occurs with the infrastructure per employee variables. The decrease in the cost of equipment led to a rapid adoption of personal computers and peripherals, and the non-excludability and non-rivalry problems that characterise software has facilitated its rapid dissemination –especially, the dissemination of operating systems. Again, infrastructure indicators will have to be analysed in combination with application indicators.

[17] For further information on the shortcomings of the measurement of ICT impact through traditional performance indicators, see Peirano and Suárez (2006).

Consequently, any methodological proposal for the study of ICT adoption and use in businesses must combine investment, infrastructure, skills, and outcome indicators. It would then be necessary to think of a scheme that combines the progress and consensus achieved so as to facilitate a better approach to the analysis of complexity. Even though there is still need for more indicators, the progress made over the past few years is indisputable and to ignore such progress would mean a step back in terms of statistical information and theoretical approach.

c.1. OECD

In the particular case of ICT indicators in businesses, the conceptual model places businesses within the so-called "ICT demand," together with the families and households and the aim is to find out who uses ICTs, how, to what extent, when, with what human resources, where and why (or why not). In addition, there is the issue of the advance of e-commerce and Internet commerce, which, despite being two separate and distinct concepts, represent an important aspect of the potentialities of ICTs.[18]

OECD, aware of the importance of developing statistical indicators not only to understand the changes occurring around the Knowledge Society but also to provide accurate information for the promotion of public policies directed towards economic growth, began —in the mid-1990s—[19] to gather experiences and develop guidelines regarding the application of concepts, definitions and methods for the harmonization and international comparability of statistics and methods for analysing the Information Society.

Currently, given the complexity and transversality of the Information Society, OECD uses a methodology characterised by a progressive and continuous approach to the objects of study, which had an effect, initially, on supply-side analyses (ICT sector statistics) and, subsequently, on demand-side analyses (statistics on ICT use).

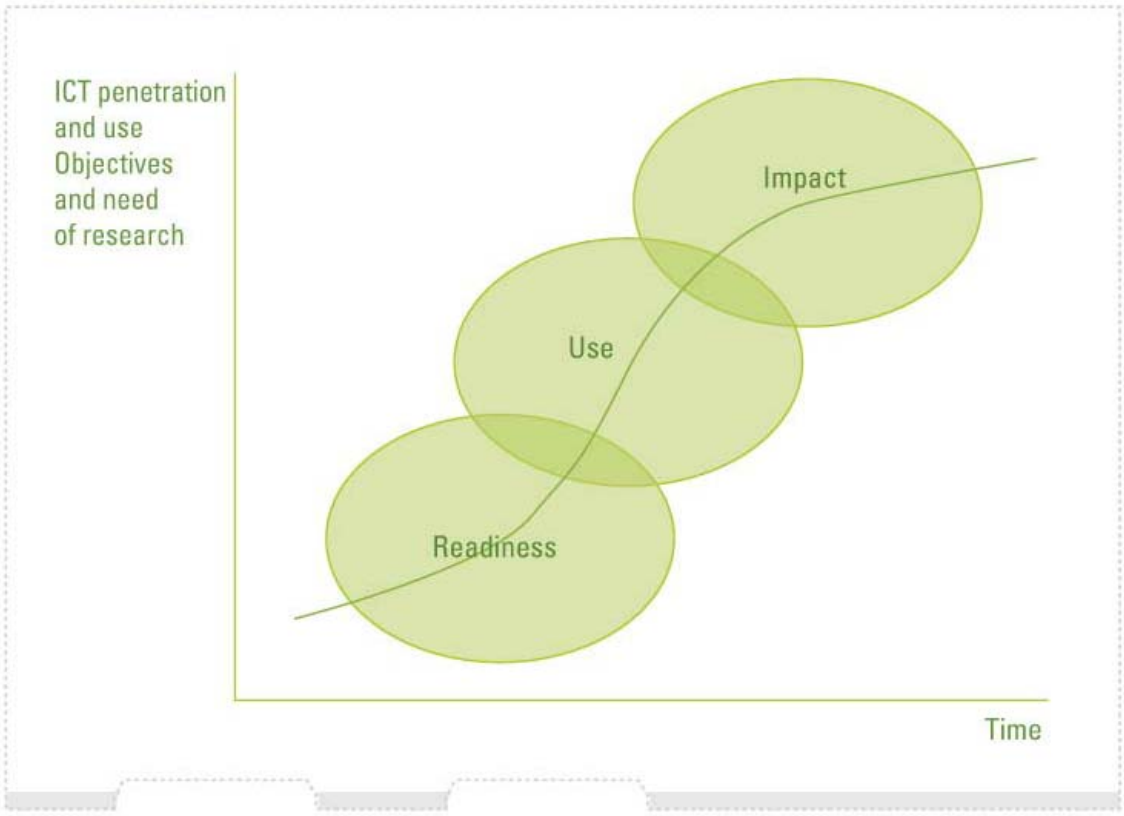
As regards ICT use by businesses, in order to define basic and general indicators, OECD prepared, in collaboration with Eurostat and the Voorburg Group, a model questionnaire, adopted in 2001, to assist in the analysis of how ICTs are being adopted and used by the socio-economic activity (OECD, 2001).

The development and analysis of the indicators and the questionnaire follow the logic of an analysis model developed by OECD, according to which research objectives and needs are determined by the level of market maturity. This analysis model, illustrated by the S curve (Figure 4.1), makes it possible to trace the diffusion of new technologies through three sets of indicators: readiness, intensity of use and impact.

[18] While a discussion of the difference between both concepts is beyond the scope of this document, it is worth noting that although it is recognised that the evolution of these technologies is leading to the convergence of the two marketing methods, they take place through different channels (the Internet and specific platforms) and, therefore, they should be treated separately. For further information, see OECD (2007).

[19] In early 1997, the Working Party on Indicators for the Information Society (WPIIS) was created to assist in the development and recommendation of Information Society indicators.

Figure 4.1.: ICT Penetration and Use – The Research Agenda



Source: OECD (2001)

In 2005, after more than 10 years of work, the WPIIS published the Guide to Measuring the Information Society, which is a "compilation of concepts, definitions, classifications and methods for Information Society measurement and analysis" (OECD, 2007). This Guide includes, among other things, the progress made by the Partnership on Measuring ICT for Development and EUROSTAT and is a compendium of recommendations regarding indicators and key methodological definitions, aimed specifically at OECD member countries. However, it includes some qualifications and recommendations to encourage non-member countries to also make an attempt at measurement standardization. The idea underlying the recommendations regarding measurement in businesses, just like in the case of EUROSTAT, is that ICTs are a tool that can help raise the overall efficiency of the use of capital and labour. It is assumed that the benefits of ICT implementation are directly related to the degree of integration between functions within the business.

In 2007,[20] the revised version of the Guide incorporates EUROSTAT's work[21] on measuring ICT in businesses and provides and updated version of the first model questionnaire, which seeks to minimise the number and complexity of the original questions as well as to adjust the proposed indicators to policy-relevant areas. In addition, the Guide recommends, as a minimum common denominator, businesses with more than 10 employees as the statistical unit and the breakdowns for ISIC sections C D, F, G, H, I and K and size.

[20] Between 2008 and 2009, the Guide has been under review –basically with regard to the classification of ICT goods- and the new edition is expected to be published in late 2009.
[21] Currently, EU countries comprise over two-thirds of OECD countries. At the same time, some of OECD member countries are using EUROSTAT questionnaires.

The model questionnaire is composed of three sections: general information on ICT use, ICT applications and, very briefly, general information about the business. The first section includes computer use, employees using ICTs, the Internet and security. The second section covers Internet-based applications, perceived benefits, barriers and integration with the rest of the business. Finally, the questionnaire includes questions regarding activity, sales and employment, which variables are used to define the abovementioned size and industry sector breakdowns. This way, the resulting indicators are compatible with the set of indicators agreed at the World Summit on the Information Society in 2005 (Table 4.1) and, at the same time, it provides a more detailed analysis of the implementation of more complex technologies.

Table 4.1.: Core Indicators on ICT Access and Use by Businesses- OECD

Basic core
1. Proportion of businesses using computers
2. Proportion of employees using computers
3. Proportion of businesses using the Internet
4. Proportion of employees using the Internet
5. Proportion of businesses with a website
6. Proportion of businesses with an intranet
7. Proportion of businesses receiving orders over the Internet
8. Proportion of businesses placing orders over the Internet
Extended core
9. Proportion of businesses accessing the Internet by modes of access (Response categories should allow an aggregation to narrowband and broadband, where broadband will exclude slower speed technologies, such as dial-up modem, ISDN and most 2G mobile phone access, and which will usually result in a speed of at least 256 Kbit/s)
10. Proportion of businesses with a Local Area Network (LAN)
11. Proportion of businesses with an extranet
12. Proportion of businesses using the Internet by type of activity: • E-mail • Getting information - About goods or services - From government organizations/public authorities via websites or e-mail - Other information searches or research activities • Performing Internet banking or accessing other financial services • Dealing with government organizations/public authorities • Providing customer services • Delivering products online

Source: OECD (2005)

With this form, the differences between e-commerce, Internet commerce and e-business, meaning "(automated) business processes (both intra- and inter-firm) over computer-mediated networks" (OECD, 2007) are also established. However, despite the stated intention of measuring the impact of ICT use on businesses' functions, it was agreed that questions regarding the use of specific software such as Enterprise Resourse Planning (ERP) and Costumer Relationship Manager (CRM) should be excluded given the interpretation problems that could arise during the survey.

The Guide also stresses the importance of measuring the intensity of use of these tools. However, such measurement entails using questions open to ambiguous interpretation (such as "number of linked transactions") and some limitations resulting from the use of dichotomous questions insofar as they do not allow to ascertain the significance of positive responses. In other words, if two businesses perform linked

transactions but involving different degrees of complexity, yes/no questions would not help establish the differences, and questions about quantity or complexity would leave the measure of intensity to the subjective perceptions of the respondent.

Another source of conflict is the questions related to inputs, especially because a definition of ICT products (hardware and software) is required so that traditional investment indicators in respect of sales can provide comparable measures. There is also the issue of the so-called embedded software: if a business purchases equipment that includes a computer program, should it be regarded as an ICT investment or is it an investment in capital goods? If we answer "yes" to the first question, then what part of that investment should be classified as ICT inputs?

The guide presents an exhaustive classification[22] of ICT products, and with respect to ICT embedded in other goods, the proposal is to collect additional information on investments in order to include in the analysis the information and communication technology input related to the production process and the search for new products and processes. That is to say, the idea is to make progress in making the different business surveys compatible in order to understand ICT use and implementation in the context of the search for innovation and competitiveness as well as the impact of these technologies on the demand for skilled labour.

Despite these clarifications, and as is the case with the questionnaire used by EUROSTAT, the model survey does not include questions regarding ICT investment or the availability of skilled personnel either. This seems to run counter to the importance attached to that in the Guide. It would therefore be reasonable to presume that they are not included because it is assumed that this information is collected through other surveys. It should also be noted that the question regarding employees using the Internet refers to a share of total employment, which would therefore be determined by the type of activity carried out by the business rather than the level of ICT use.

In addition, the Guide includes an annex regarding measurement in developing countries. Essentially, this annex is concerned with the significant heterogeneity between developing countries, especially in relation to the complexity of the technologies implemented —in some regions, it is necessary to include questions about radio and television penetration. Financial limitations are also taken into account insofar as questions regarding ICT are included in other surveys instead of conducting dedicated ICT surveys.

Recommendations are based on the progress made by the Partnership on Measuring ICT for Development[23] and on the data collected by international organizations such as the International Telecommunication Union (ITU).[24] For the specific case of ICT measurement in businesses, the Guide recommends the same set of indicators proposed by the Partnership, to which OSILAC adheres (see sections c(2) and c(3)).

[22] In extremely brief terms, ICT goods/services are defined as all goods and services that enable the function of information processing, transmission and/or communication by electronic means. (OECD; 2007)

[23] Created in mid-2004, the Partnership on Measuring ICT for Development is an organization which seeks to assist in the adoption of internationally comparable indicators to measure the development of the Information Society. This organization's objective is not only to identify the most efficient indicators but also to coordinate the activities of the National Statistical Offices (NSOs) of several countries in order to strengthen individual results and foster the development of a global database on ICT indicators. The Partnership is endorsed by organizations that are interested in improving measurement of the Information Society: OCDE, UNCTAD, UNESCO Institute for Statistics, Eurostat, the World Bank, ITU and OSILAC – ECLAC are some of the institutions that are members of the Partnership and participate in the discussions.

[24] At present, there are several initiatives aimed at generating and disseminating statistics and analyses regarding the Information Society. Such is the case with the Orbicom Network, comprised of public and private institutions such as UNESCO, IDRC (Canada) and ITU.

The proposed list is composed of a set of 8 basic and 4 extended core indicators. The first set refers to the traditional measurement of computer use, the Internet and use by employees as well as commercial transactions over the Internet. The extended set includes the type of access to the Internet, the use of intranets and extranets and their applications. Just like in the case of the households row, a round of revisions of the common set of indicators will take place during 2009, and it is expected that the distinction between the basic core and the extended core will disappear.

Heterogeneity is perhaps the distinguishing feature of the Ibero-American region. However, heterogeneity is also present within each country. Therefore, not only reference indicators –such as availability of basic infrastructure, even electricity infrastructure– but also more complex indicators are required. One of the recommendations from the WPIIS Guide is that the study of the so-called "best practices" is a key step towards the development of policies that foster the transition to the Knowledge Society. Nevertheless, although it impossible to ignore the importance of these analyses, it is also necessary to identify "good practices" within each country to understand their determinants. In other words, it is essential to identify successful cases and, to that end, appropriate indicators are required.

As stated in the Guide, the limitation that results from the lack of resources to conduct ICT-specific surveys is also apparent, which in turns limits the amount of information to be collected. In many countries, ICT-related questions for businesses are included in more general questionnaires (such as annual industrial surveys or innovation surveys). Therefore, it is necessary to identify key information in order to minimise the number of questions and, as developing countries achieve the technological standards of developed countries in terms of basic –or less complex- technologies, these questions may be replaced with more complex ones. Clearly, such replacement can only take place at the country level, thus hindering regional comparability. Finding a minimum common denominator to achieve homogeneity of questionnaires on the one hand while ensuring national relevance on the other will require a concerted effort by the affected countries. The indiscriminate use of predesigned questionnaires by regions with different relative levels of development may lead to the collection of data based on a low level of response, which, at best, would confirm that the average level of development of the region is lower than that of developed countries –something that does not require an additional survey.

c.2. EUROPEAN UNION / EUROSTAT

The European Union's approach to the transition to the Knowledge Society in businesses consists in the study of the level of penetration and use of the new information and communication technologies in these organizations, where the statistical unit is the business with more than 10 employees (although countries have the option of including smaller businesses). The reference period is the first quarter of the survey year and the target population includes the businesses classified under ISIC sections D, F; G, H, I and K (EC, 2008a).

At the beginning, ICT analysis was based on the number of businesses with computers, Internet access, broadband, web presence and purpose of Internet access (basically, email, home banking and e-government) and e-commerce studies. However, over the past few years, the general theoretical approach shifted towards the study of e-business, based on a strategy to generate statistical data that can be used to assess the impact of ICT implementation on the productivity and competitiveness of businesses.

This shift in theoretical approach is the result of systematic progress towards achieving the targets set in the eEurope 2002 (EC, 2000) and eEurope 2005 (EC, 2002) action plans and the current i2010 strategy (EC, 2005). In all cases, the basic goal is to make the European Union "*the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion by 2010*". This statement was the result of a 10-year forward-looking plan devised by the heads of State of the member countries and known, ever since, as the Lisbon Strategy, for which purpose specific policy measures were established to make the economic and structural reforms necessary to achieve that goal. In this context, ICT diffusion across all sectors of society became a key objective (EC, 2000).

The latest evaluations of the i2010[25] strategy indicate that there have been significant achievements in terms of connectivity and development of virtual interactive environments. Special mention is made to the leading role of governments in the provision of broadband infrastructure and services, which has fostered content expansion and greater diffusion of Internet use among households and businesses for commercial transactions.

Based on the strategic objectives of the Plan —and taking into account the need for regular updates to measure such dynamic technologies—, adjustments were made to the questionnaire for ICT measurement in businesses. The purpose was to make previous questionnaires more complex while maintaining the focus on infrastructure and use. The questionnaire comprises 7 sections: computers and networks, Internet access and use, automated data exchange, electronic information exchange along the supply chain, electronic information exchange within a business, e-commerce and perceived benefits from ICT use (EC, 2008a).

Based on these sections, it is possible to assess the stock of technologies available in the business (from the simplest to the most complex ones), the use of such technologies as well as their impact. The questions about perceived benefits are a first attempt to capture the productivity differential associated with ICT adoption, by distinguishing 4 dimensions: reorganization and simplification of work routines, release of resources, higher earnings, and development of new products and services.

From the information provided in the questionnaire, it is possible to develop a large number of indicators, from which 15 have been selected to conduct the traditional European benchmarking studies. These indicators, set out in the i2010 action plan are shown in Table 4.2 below.

Table 4.2.: i2010 Benchmarking Indicators – Adoption of ICTs by Businesses (EUROSTAT)

Indicators on Basic Connectivity and ICT Adoption
1. % of enterprises with broadband access
2. % of persons employed using computers connected to the Internet, in their normal work routine
3. % of enterprises with a LAN and using an intranet or extranet
4. % of enterprises with broadband access
5. % of enterprises using open source operating systems
e-Commerce
6. Turnover from e-commerce as % of total turnover
7. % of enterprises having received orders via computer mediated networks,

[25] http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm

where these are ≥1% of total turnover
8. % of enterprises having purchased via computer mediated networks, where these are ≥1% of the total purchases
e-Business
9. % of enterprises whose internal business processes are automatically linked
10. % of enterprises whose business processes are automatically linked to those of their suppliers and/or their customers
11. % of enterprises using software solutions (such as CRM) oriented to improving relations with clients
12. % of enterprises sending and/or receiving e-invoices
13. % of enterprises that make sales on the internet and whose online sales system offers the capability of secure transactions
14. % of enterprises using advanced e-signatures in the relations with their suppliers and/or their clients
Employment and Skills
15. % of persons employed with ICT user skills
16. % of persons employed with ICT specialist skills

Source: EC (2006a)

ICT surveys in businesses are certainly not the only way in which EU countries address the issue of the transition to the Knowledge Society (for example, workforce surveys are used and the ICT household survey is also used in relation to e-skills). On the contrary, these surveys fall within the more general approach mentioned above: ICTs as a means to improve the productivity of businesses, which in turn must converge on the community. In other words, ICT surveys are analysed by considering levels of use and intra-area diffusion and impact in terms of extra-area productivity.

As regards productivity, it is said that *"ICTs make innovation possible, which is a direct consequence of the ambiguous relationship between ICT investment and business performance*" (EC, 2007). It is within this framework that the complementarity between ICT use and highly skilled human resources is acknowledged and, in addition, it is assumed that the greater the use of ICTs, the greater the impact on performance.

The interrelation between the ICT sector in particular and the adoption of these technologies by businesses leads, in general, to economies of scale and complementarity that bring mutual benefit to both sectors. According to a recent report, the development of the ICT sector not only encourages a reduction in the cost of products, but also increases the chances of adopting these new technologies (EC, 2006b). This dynamic creates a virtuous circle in which ICT demand fosters the development of the production sector. In addition, the existence of sector specificities and the importance of the scale are acknowledged: the more knowledge-intensive production activities are, the greater the benefits that ICT adoption will yield, and the greater the size of the business, the greater the efficiency derived from the adoption of these technologies.

The measurement of all these variables is conducted through sector-specific studies,[26] which are developed within the framework of E-business W@tch,[27] and through international studies, such as the Lisbon Strategy review reports (EC, 2007b). The purpose of these studies is to summarise the different levels of progress by businesses through the development of more complex indices to facilitate regional and international comparisons.

[26] See, for instance, European Commission (EC, 2008b).
[27] www.ebusiness-watch.org

The main complex indicator is the European e-business Readiness Index (EC, 2008b), composed of 12 simple variables: 6 regarding *adoption* and 6 related to *use* (Table 4.3). These variables are added based on weights estimated by specialists from member countries. From this procedure a single measure is obtained to rank the countries of the community.

In sum, the progress achieved in terms of measurement in the European Union illustrates the importance of enhancing ICT measurement in businesses by supplementing the traditional questions (investment, computers, Internet access, website) with questions associated with the strategic objectives of the business (role of ICT in innovation, characterisation of human resources) and ICT impact (improvement in work routines, productivity and competitiveness).

Table 4.3.: European e-business Readiness Index

Basic Indicators of adoption of ICT	Weight
1. Percentage of enterprises that use Internet	0.18
2. Percentage of enterprises that have web/home page	0.16
3. Percentage of enterprises that use at least two 2 security facilities at the time of the survey	0.10
4. Percentage of total number of persons employees using computer with their normal work routine	0.16
5. Percentage of enterprises having broadband connection to Internet	0.21
6. Percentage of enterprises with LAN and using an Intranet and Extranet	0.20
Use of ICT	
1. Percentage of enterprises that have purchased products / services via the internet, EDI or any other computer mediated network, where these are ≥ 1% of total purchases	0.17
2. Percentage of enterprises that have received orders via the internet, EDI or any other computer mediated network, where these are ≥ 1% of total turnover	0.17
3. Percentage of enterprises whose IT systems for managing orders or purchases are linked automatically with other internal IT systems	0.21
4. Percentage enterprises whose IT systems are linked automatically to IT systems of suppliers or customers outside their enterprise group	0.21
5. Percentage of enterprises with Internet access using the internet for banking and financial services	0.12
6. Percentage of enterprises that have sold products to other enterprises via a presence on specialised internet market places	0.13

Source: EC (2008b)

The European Union has made systematic progress in terms of measurement, and what we see today is the result of almost a decade of sustained development. The internal consistency of the proposed indicators facilitates subsequent analysis and the understanding of the phenomenon in the context of the search for a competitive production structure rather than in isolation. Applying the methodologies and developing the indicators proposed by Eurostat would facilitate benchmarking analyses and help monitor the existing gap in these countries. This, in a context where the information that is currently being collected is not too dissimilar to that proposed by Eurostat. However, it is important to draw attention to the possible negative consequences of using these indicators without making any adjustments. Applying these recommendations may lead to erroneous assumptions regarding the average level of progress of the region, which in turn could result in the unavailability of relevant information for decision-making in the public and private sectors.

In this regard, the general approach of the current ICT questionnaire is very close to the methodological proposal described here, which recognises the need to progress towards the measurement of more complex ICT applications as well as the need to analyse them in the general context of the performance of a business. In this connection, the perceived benefits section is a good approximation given that it identifies clearly differentiated areas (work routines) within a business. However, if it were to be applied to businesses in countries of lower relative development, the first shortcoming of this question would be the fact that it only applies to businesses that have developed projects, which implies a formal technology implementation plan. While this requirement is not always met by the businesses of the region, it does not mean that there has been no investment in ICT.

A second shortcoming is related to the lack of questions that are relevant to the region. In the abovementioned questionnaire, there are no questions regarding ICT-related human resources and investment in these technologies. Therefore, it is not possible to gather information about demand for human resources, skills associated with ICT use and investment in equipment (hardware and software), training and system development. The reason these questions are not included is not because they are not considered relevant, but rather because this kind of information is collected through other statistical surveys. In developing countries, by contrast, given the difficulties associated with data collection, the importance of the human resources issue[28] and the need to strengthen physical and monetary inputs, it would be convenient to include them in the ICT questionnaire.

With regard to indicators such as the European e-business Readiness Index, the problem lies in the underlying assumptions. For example, the percentage of people using computers in their daily work routines is perhaps more related to the type of activity of the business than to the level of ICT adoption. The core indicators account for technologies and applications that are relatively common in the region but that do not necessarily entail a higher level of progress towards the Knowledge Society. Consequently, the index would only help to rank businesses based on these technologies and this type of applications but it would not provide any information regarding the desired goal. At the same time, it would be necessary to first assess whether the needs of the businesses in the region correspond to the core indicators and whether these are the necessary indicators to monitor the transition to the Knowledge Society in Ibero-America.

Another difficulty associated with this type of indicators is that the result corresponds to what would be expected: developed countries rank higher, which could indicate the existence of a strong correlation between the selected variables and other economic variables: GDP per capita, production specialization patterns, labour productive forces, etc.[29] If this were the case, then the index would be capturing the consequences rather than the causes of a greater relative development.

c.3. UNITED NATIONS / ECLAC / OSILAC

In recent times, Latin America has been the scene of the development of a large number of initiatives designed to strengthen the measurement of the Information Society in the region. Rather than focusing on new indicators, such initiatives have addressed the problems relating to the standardization of the information collected from

[28] To the extent that they are either a limiting factor affecting the development of these technologies or an approximation of the spillovers from a business to the rest of society.

[29] This kind of correlation is also present in other complex indices such as the e-Readiness Ranking, published by The Economist Intelligence Unit (2008) and the Networked Readiness index, compiled by the World Economic Forum (2008).

the small group of countries that conduct ICT surveys and the way to overcome the obstacles to conducting such surveys in the rest of the countries.

In contrast with what is observed in developed countries, the creation of a Harmonised ICT Statistical System in Latin America faces major difficulties resulting from the disparity in the development level of the statistical systems of the region. In this respect, the countries of the region are faced not only with budgetary and human resources constraints but also with the problems that these circumstances pose to the coordination and harmonization of statistics.

The measures taken involved adapting some of the most important experiences of developed countries to regional circumstances as well as implementing some actions developed by Latin American countries themselves. Among the main projects is the Observatory for the Information Society in Latin-America and the Caribbean (OSILAC) sponsored by ECLAC and by the Institute for Connectivity in the Americas (ICA-IDRC), with support from the European Commission through the @LIS Program.[30]

The list of indicators proposed by OSILAC is based on the Compendium of Practices on the implementation of ICT questions in household and business surveys (Olaya, 2007), which is the adaptation, to Latin America and the Caribbean, of the set of recommendations from the "Core indicators regarding information and communication technologies" document, which summarises the Partnership agreements (Partnership, 2005)

The Global Event on Measuring the Information Society, also organised by the Partnership, was held during 2008 to discuss and review the existing lists of agreed indicators. However, OSILAC's recommendations continue to be based on previous meetings given that, to date, the round of revisions and agreements has not been completed.[31]

The list of indicators currently available is the one developed from the consensus reached at the 2005 meetings and that is still under review. It is expected that a revised list of indicators will be available by late 2009. This is due to the need to keep pace with the advances of technologies —for instance, the introduction of new production management tools— and the availability of information, which would make it possible to expand the range of questions to include questions about impact, at the same time as indicators are aligned with the recommendations of the Partnership and the progress made by OECD and Eurostat and the recently published Manuals on ICT measurement: ICT in Households and Businesses (ITU, 2009) and the statistics on the Information Economy (UNCTAD, 2009). In addition, given the progress achieved in national measurement systems, it is expected that in future recommendations the distinction between basic and extended core indicators will be removed.[32]

The San Salvador Commitment was adopted in 2008, which defines the necessary actions to continue with the Strategy for the Information Society in Latin America and the Caribbean (eLAC), eLAC 2010 in this case, which was the continuation of the commitment undertaken within the framework of eLAC 2005 (in that same year). The eLAC 2010 maintained the strategic objectives of its predecessors, including a series

[30] The main purpose of OSILAC, which is a member of the Partnership on Measuring ICT for Development, is to provide support and coordinate the efforts of the different NSOs in order to harmonise the indicators and methodologies used for measuring the state of development of the Information Society in the region as well as to compile the data resulting from the different surveys and foster the development of new skills to improve the quality of the data collected.

[31] The proposal is available at http://new.unctad.org/templates/Event 888.aspx.

[32] For more details, see the documents and presentations of the Fifth Regional Workshop on Information Society Measurement in Latin America and the Caribbean at www.eclac.org/SocInfo/OSILAC/.

of recommendations for the countries of the region designed to foster and coordinate the transition to the Knowledge Society in the region (ECLAC, 2008). The main idea of this commitment relates to the design and implementation of national strategies that are also consistent with supranational goals.[33] Since 2005, OSILAC has been the institution in charge of monitoring the implementation of eLAC with a view to meeting the 2015 final deadline in order to offer governments the necessary tools to carry out a comparative analysis of the state of development at the local level and to learn from experiences in other countries. Since then, OSILAC has organised, in concert with several institutions, a series of technical assistance workshops and regional meetings which reportedly helped consolidate the proposed ICT measurement network.

In relation to the main progress achieved in measuring ICT development in the business sector, it should be noted that OSILAC's monitoring (2007) regarding progress and the state of development of the eLAC shows that Latin America and the Caribbean constitute a highly heterogeneous region. However, and despite the dispersion, the average results have been relatively satisfactory, with more progress in the activities undertaken by the private sector than those carried out by all other actors.[34]

As can be seen in Table 4.4, the proposed indicators consist of a basic core designed to collect information about computer availability, intranet and Internet access, commercial transactions via Internet and number of employees using these technologies. In addition, there are extended core indicators designed to gather information regarding the type of Internet connection, Internet use and extranet availability. It should be noted that ICT use to integrate the different areas of a business and provide support to key processes (CRM, MRP) is expected to be included in the 2009 indicators review.

[33] See Chapter 3, section c.3.

[34] The results from the monitoring conducted by OSILAC show that the level of web presence of the businesses in the region is comparable with average levels of developed countries (over 90% of businesses with more than 10 employees have web presence).

Table 4.4.: Indicators of ICT Access and Use by Businesses

Basic core
Proportion of businesses using computers
Proportion of employees using computers
Proportion of businesses using the Internet
Proportion of employees using the Internet
Proportion of businesses with a website (or web presence where the business has control over the content)
Proportion of businesses with an intranet
Proportion of businesses receiving orders/ selling over the Internet
Proportion of businesses placing orders / purchasing over the Internet
Extended core
Proportion of businesses accessing the Internet by modes of access • Response categories should allow an aggregation to narrowband and broadband, where broadband will exclude slower speed technologies, such as dial-up modem, ISDN and most 2G mobile phone access, and which will usually result in a speed of at least 256 Kbit/s.
Proportion of businesses with a Local Area Network (LAN)
Proportion of businesses with an extranet
Proportion of businesses using the Internet by type of activity: • Internet e-mail • Getting information - About goods or services - From government organizations/public authorities via websites or e-mail - Other information searches or research activities • Performing Internet banking or accessing other financial services • Dealing with government organizations/public authorities • Providing customer services • Delivering products online

Source: OSILAC (2005)

The eLAC 2007 progress report states that even though between 2005 and 2006 eighteen countries of the region included a question in their household surveys for the preparation of the basic indicators, only 8 countries adopted questionnaires containing key questions relating to businesses (Argentina, Brazil, Chile, Cuba, Peru, Uruguay, Panama and the Dominican Republic). Therefore, out of the 33 countries which comprise the region, only 24% have measured the level of diffusion of information and communication technologies in the business sector.

Once the proposal for basic indicators was agreed with the NSOs of the region, OSILAC continued with the development of a "Compendium of Practices on the Implementation of ICT Questions in Household and Business Surveys" (Olaya, 2007), which compiles some of the main methodological discussions and experiences relating to the issue of measurement and collaboration in the design and dissemination of ICT measurement practices in the region.

Among the main obstacles to the harmonization of statistics is the conflict related to the coverage of the businesses surveyed. The use of different types of surveys (whether ICT-specific, general business sector or innovation surveys) involves dealing with different sample populations.

Similarly, many economic variables used are not uniformly defined in the different surveys, which would be hindering comparison of results.[35] Another reason for discrepancy between measurements would result from the varying frequency with which surveys are conducted.

As regards the main shortcomings of the first generation of ICT indicators, Olaya and Peirano (2007) point out that they do not provide a measure of the impact of the new technologies on business performance or the competitiveness of the economy as a whole. Therefore, insofar as these indicators seem to be focused on aspects relating to the provision of equipment and infrastructure, they are still not accurate enough to show the differences in ICT adoption and impact.

The Fourth Workshop on Information Society Measurement in Latin America organised by OSILAC was held in February 2008. The workshop was attended by representatives of 20 countries of the region, among them 18 delegates of National Statistical Offices and international organizations such as UNCTAD and RICyT.

The main purpose of the workshop was to present the progress made towards harmonization of ICT statistics. As a result of that meeting, the difficulties faced by some countries in collecting statistics relating to businesses were identified. In addition, it was proposed that working groups be created to deal with specific issues. The main purposes of Working Group No. 2, called the *Definition of new indicators in business surveys and agreements on methodological aspects* group, are to make proposals for indicators to measure the socio-economic impact of ICTs; analyse the methodological difficulties associated with surveys; review the proposals submitted by other countries and regions; and, finally, suggest solutions for the methodological difficulties identified.

Based on the discussions held during the Fourth Workshop, OSILAC published a series of working documents. Two of them are particularly interesting for the issue analysed in this section. Working Document No. 1, *Harmonization of indicators about access and use of ICT in households and business* (OSILAC, 2008a), presents a compilation of the progress of research on the existing obstacles to achieving full harmonization of ICT indicators. In this connection, the document highlights the importance of this type of work in order to ensure the success of the OSILAC initiative, the Working Group on ICT of the SCA-ECLAC and the Partnership on Measuring ICT for Development in relation to the harmonization of indicators. The document contains a series of remarks regarding the need to clarify or supplement some of the questions included in the questionnaires in order to improve data comparability.

The document also stresses the need to supplement the questions relating to the number of employees using the Internet with a question about the total number of employees in order to compare the relative importance of these employees on each business's payroll. Such difficulty may also be overcome by formulating the question based on percentages of employees using the Internet (it should be noted that surveys that include this question based on percentage ranges have drawn strong criticism). Furthermore, the document mentions that those countries including questions about electronic transactions should differentiate between transactions made via email and those made using any other web tool such as a special platform on the business's website.

Finally, the document also makes reference to the much-discussed issue of the target population, and therefore recommends including questions about ICT in any kind of

[35] This is the case, for instance, with the definitions of business size based on the number of employees or on annual turnover. Similar problems arise with the classifications used for the distribution of businesses by sector.

statistical survey and emphasises the need to consider the target population of each survey.

Working Document No. 2 of the Workshop, *Proposal to advance towards the measurement of new indicators relative to ICT impact in business* (OSILAC, 2008b) highlights the positive role of the studies published by ECLAC and RICYT concerning the need to supplement ICT infrastructure, access and use measurements with indicators that help obtain some measure of the impact of new technologies not only on the productivity and performance of a business, but also on economic growth. In addition, it acknowledges the need to develop indicators of ICT investment as well as of business perception of the adoption of these technologies. In order to achieve this goal a series of questions are put forward that are designed to complete existing questionnaires relating to: motivations for ICT use; perception of benefits, ICT investment (amount and source(s) of funds), availability of Resources Management and Administration tools; employees specialised in ICTs, expenditure on employee training in this area; number of skilled employees over total employees of the business and destination and origin of transactions over the Internet.

In sum, efforts to harmonise surveys in businesses have yielded good results insofar as the vast majority of the countries that perform this type of measurements do so based on the questionnaires recommended by the Partnership. The use of different target populations in surveys is the main obstacle to harmonization efforts. In this respect, it should be noted that in contrast with what happened in the European Union, there has been no progress in the development of common definitions, which tends to hinder data comparability.

In addition, with respect to new questions and indicators, efforts seem to be directed, for the most part, towards measuring the impact of ICT adoption on business performance as well as quantifying the amounts allocated to investment in this type of activities and ascertaining business perception of the adoption of new technologies. Nevertheless, there are still very few countries with information regarding the transition to the Knowledge Society by businesses.

However, it should be noted that even though there are very few countries with available information about ICT adoption, analysing their experiences and monitoring their progress could become a key input into improving statistical information and ICT impact on the region. Given that the main purpose of OSILAC is to advance the development of indicators and the collection of internationally comparable data, the opportunity to make progress in the analysis of the most successful measurement cases is limited by the need to ensure convergence of measurement practices. In other words, it would seem appropriate to go further in the development of a set of indicators that can help capture more complex aspects of ICT adoption in the businesses of the region, at least in those countries where business surveys are already being conducted. This way, those countries where there is still no information available could draw on the experiences of national statistical offices, and the availability of statistical data would also facilitate better development and implementation of public policies designed to strengthen and foster the transition to the information society.

d. Towards a Strategy for Analysing the Businesses Row for Ibero-America

d.1.The Need for a Comprehensive Approach

As a result of the progress made by many countries in measuring the transition to the knowledge society in businesses, the inter- and intra-regional heterogeneity in terms of

ICT penetration evidenced the need for a set of indicators that could capture the different dimensions of these technologies, from the most basic to the most complex.

When we attempt to open the “black box” and see what transformations take place within a business with the arrival of ICTs, we soon begin to see the organization as a set of administrative, production, commercial processes, etc. The choice of this approach is highly functional for detecting the kind of contribution that ICTs will make, insofar as these technologies can streamline, cheapen and strengthen the activities carried out by the organization.

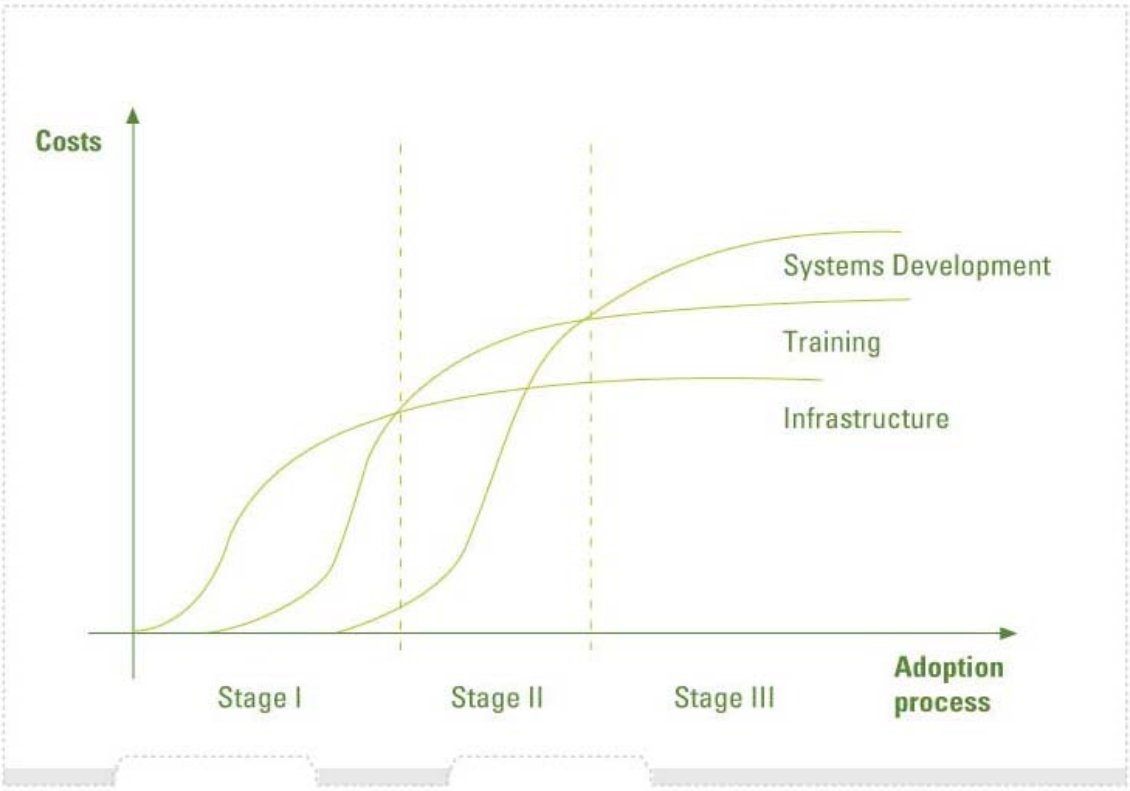
In short, the assessment of the diffusion of the digital paradigm among businesses by confining the analysis to the inventory of installed equipment leads to serious distortions. Indeed, this occurs because human resources skills and systems capabilities are not being taken into account. These aspects determine the degree to which these technologies are used and are extremely relevant for explaining the differences in performance between businesses, even among those with similar levels of equipment. This is not to say that measuring infrastructure is not important. On the contrary, it is intended to show the need to supplement this type of indicators with skills indicators. As stated by López (2003), ICTs cannot be expected to help countries emerge from underdevelopment, nor can we expect unequal distribution of income and wealth to be overcome solely through a process of ICT adoption and use, even though these technologies have the effect of excluding those who are left outside ICT use (quoted in Baptista, 2005).

Once a certain level of complexity is attained, if ICT implementation is not geared to provide support to a new type of work routine, the impact of these technologies on performance tends to be nil, or even negative.

It therefore follows that it is necessary to redesign existing indicators in order to adapt them to a highly complex and dynamic reality. Thus, one way of advancing in this direction is through cost indicators —clearly applicable to the analysis of ICT investments/inputs. From the perspective of total costs, several analyses have shown that these indicators reflect the direct relationship between an increase in complexity and investment requirements.

Figure 4.2 shows an approximation of the cost curves associated to different aspects of ICT adoption. Given the characteristics of new technologies, the transition from one level of complexity to another leads to a discontinuity in the cost curve. This is due to the fact that the expenses incurred by a business during the ICT adoption process involve three different areas: infrastructure costs, training costs and system development costs.

Figure 4.2.: Relationship between Costs and Complexity of ICT Adoption



Source: Peirano and Suárez (2005b)

Based on the identification of these three components, it is possible to formulate the following hypothesis: the dynamics of the process under analysis is explained by the prominence of each of these costs at each stage. We use the term prominence because these cost curves are S-shaped, and the higher slopes are spaced apart in time and associated with a different stage along the ICT adoption path.

Consequently, the next step is to determine which indicators are the most relevant for describing and assessing the ICT adoption process within businesses. In principle, it would be necessary to have three classes of indicators to show the evolution of each type of dimension to be developed (infrastructure, human resources, systems development). Furthermore, it would also be important to consider the different types of possible inputs in order to move forward with the characterisation of the adoption stage each business is at.

At the moment, the most common indicators are only concerned with infrastructure. If they are applied to businesses that have completed the first stage, these indicators do not accurately reflect differences between them −resulting from the abovementioned heterogeneity of skills and capabilities involved− and instead show similarities where differences exist.

d.2. Reflections and Progress from the Fourth Seminar

During the Fourth Seminar, attendees discussed the progress achieved by the main international organizations regarding methodologies, indicators and consensus as well as factors to consider when applying indicators developed in another region. This helped outline a framework for analysis in line with regional heterogeneity. As a result, a methodological approach based on existing indicators was proposed in order to

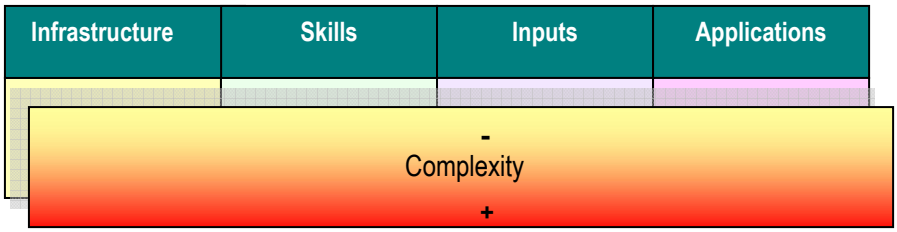
achieve the double objective of international comparability and national relevance. The advantage of this analysis scheme is that the proposed set of indicators includes the available indicators and those which, though not available, have already been agreed.

Given the work conducted within the framework of the Sub-network and the level of dissemination of ICT indicators, it became apparent that there was a need to develop a framework for analysis which, based on existing indicators, provided a first approximation of the complexity of this phenomenon. This analysis framework is presented below.

The original proposal is based on the contribution made by Lugones, Suárez and Moldován (2008)[36] and consists in the analysis of the transition to the Knowledge Society based on the study of the four dimensions of the matrix: inputs, applications, skills and infrastructure. The analysis of these four dimensions becomes essential insofar as ICT implementation does not occur simultaneously, nor does it have the same impact or level of complexity. (Figure 4.3)

If we understand ICT implementation as a process, different levels of complexity can be assigned to the different technologies, which in turn will require different inputs and skills in order to maximise the impact of the applications. In other words, while in a first stage key investments must necessarily be made in basic hardware and software, as technology becomes more complex, more business-specific type of inputs are required. At first, ICT implementation relates to the introduction of personal computers and canned programs, which requires a relatively low level of skills. As the spectrum of ICT applications broadens, the need for training and organizational changes becomes more important. This is so because as the different activities of a business become interconnected through electronic means, it becomes necessary to make adjustments in work routines and standardise and harmonise “the way things are done”. Finally, as ICTs begin to merge into the dynamics of the business, additional inputs into the development of systems designed to address more specific needs will be required. In all cases, investment is necessary; however, a different type of input is more prominent at each stage: first infrastructure, then training, and finally systems development.[37]

Figure 4.3.: Matrix of Knowledge Society Indicators – Businesses Row



Source: Lugones, Suárez and Moldován (2008).

However, how to measure impact? Even though the ideal would appear to be related to measurements that show more efficient ways to develop routines, this does not seem quite appropriate if the aim is to develop indicators that facilitate international comparison. Therefore, the proposal is to move forward with the collection of data that reflect the level of complexity, which implies the assumption that the higher the

[36] For the application of this scheme to a selected set of countries of the Ibero-American region, see the original document.
[37] For more information about the stages of the ICT adoption process in businesses and the supporting empirical evidence, see Peirano and Suárez (2005b; 2005a).

complexity, the greater the exploitation of ICT potentialities by businesses, provided that implementation is supplemented with training and development.[38]

According to this assumption, ICT implementation must be part of a consistent and coherent strategy that considers the best use of existing resources (physical and human) and the investments to be made in order to enhance the use of these tools, where the expected result of a higher level of complexity is a greater impact on performance. The ultimate goal should be the search for increased competitiveness, whether as a result of an improvement in productivity or a reduction in costs.

This implies adopting the subject approach under the assumption that the greater the level of input and the technological complexity of applications, the greater the impact on performance. Thus, large investments that are not correlated with a higher level of complexity of the tools used (which is captured through the applications) could hardly be associated with a greater impact. In other words, it is necessary to measure both aspects. Under this scheme, asking about ICT use is still a better approximation than asking about the impact as perceived by the respondent, which leaves a much larger margin for bias, commonly associated with subjectivity.

Furthermore, it is also necessary to include as a variable in the design of indicators the information available and the different efforts made in the region regarding measurement standardization. The proposal for indicators presented below is precisely an analysis scheme of the group of available indicators, reorganised on the basis of the four dimensions of the matrix.

As mentioned above, a review of existing data and methodologies reveals that the set of indicators should meet the double requirement of international comparability and national relevance. At the same time, such set should be based on existing —or agreed— indicators but also on recommendations designed to further explore the possibilities of analysis. Similarly, based on the theoretical framework, the indicators should cover four dimensions: infrastructure, skills, investments and applications, which in turn should be differentiated according to the level of complexity of the technologies involved. Such complexity would certainly be associated with previously developed routines: standard operating procedures, strategic decisions and innovative processes.

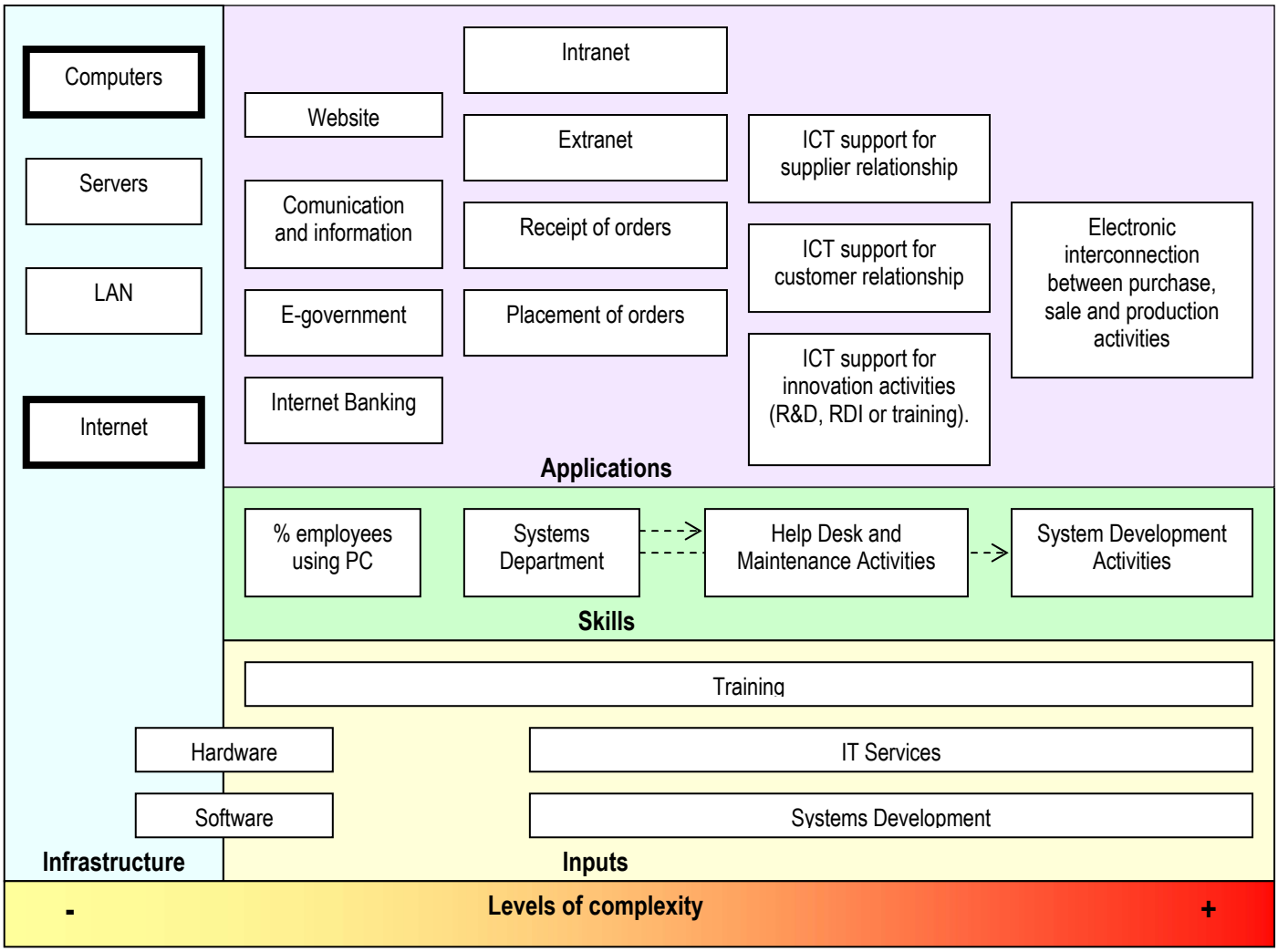
The statistical unit for the calculation of indicators is the business when the aim is to conduct a national analysis and, when the goal is to provide international comparison, the aggregate total of businesses. In the former case, the analysis of indicators by distinguishing between businesses with higher and lower levels of ICT implementation has the advantage of facilitating the identification of successful cases —for example, the analysis of the matrix between businesses which have combined investments in infrastructure and training. By contrast, the aggregate total of the “proportion of businesses” of the different indicators combines regional initiates, thus allowing benchmarking.

The proposed analysis scheme is presented in Figure 4.4. The advantage of this scheme is that it seeks to combine available indicators with a type of analysis based on levels of complexity. First, it is observed that the existing questions regarding what could be referred to as infrastructure are actually the basic conditions that a business should satisfy to begin the transition to the Information Society, especially with respect to personal computers and the Internet. In short, without computers or access to Internet, a business can hardly be expected to carry out e-banking activities or

[38] For more information regarding the shortcomings of ICT analysis based on impact indicators, see Lugones, Suárez and Moldován (2008).

exchange e-mails with its environment. In this connection, the proposal is to measure the following as “infrastructure”: availability of computers, Internet access, availability of LAN-type networks and servers. The first three are currently existing indicators (included in the recommendations issued by OSILAC, the Partnership, OECD and Eurostat). The availability of serves, by contrast, is not an agreed indicator even though it would seem to be a key source of information given that it is a requirement for many of the ICT applications that can be implemented by a business.

Figure 4.4.: Dimension-Complexity Relationship



Source: Lugones, Suárez and Moldován (2008).

Based on these infrastructure indicators, the business can move forward with different applications. In this regard, although the order of the applications follows a certain logic of complexity, it does not imply a linear order that must be followed in successive stages. The first column of indicators includes the most common applications and, with the exception of the website, involves the development of ICT applications in the environment. Only through the development of e-government and Internet banking can the business access these online activities. Websites and information exchange (sending and receiving emails, searching for information on the Web) are two widely known and easy-to-use applications; therefore, they have been placed in the lower levels of complexity.

Then, there is a second column of applications which entail a greater use of ICT tools. The development of an intranet or extranet as well as conducting commercial transactions through electronic means implies a greater development of skills within the business. In this connection, a clarification should be made regarding the relationship between infrastructure and applications. Given that the aim is to analyse the transition to the information society among businesses (and not their performance), infrastructure refers to anything that provides support to the implementation of ICT applications. While an intranet consists in an infrastructure associated with the dynamics of a business (where the purpose lies in the production of goods or provision of services), in terms of the analysis under consideration here, an intranet is a type of application insofar as the purpose of having computers and servers is, or may be, the development of an intranet to communicate them.

A third level of complexity of applications is the use of ICTs as support for production activities, purchase of inputs and sale of goods and services as well for improvement activities. In this respect, this column reflects a more sophisticated use of ICTs as a means of improving standard routines and searching for innovations. The last type of proposed application (the interconnection between all areas of the business) implies that IT tools provide support to the generation and dissemination of the necessary information for decision-making in any area (for instance, the fact that a sale causes changes in stock requirements, purchase orders, accounting records and the analysis of the situation of a business).

Finally, the use of ICTs for innovation activities deserves special mention. First, it is a rarely used indicator. In fact, no similar indicator has been considered or agreed by the Partnership or OSILAC and only partially by Eurostat and OECD. The use of these tools as support for R&D, RDI or training activities shows the way in which ICTs are incorporated into the strategic decision-making process of the business. If innovation is understood as the means par excellence of achieving genuine, sustainable and cumulative competitive advantages, the possibility of facilitating or improving these kind of activities through ICT use becomes of paramount importance insofar as it contributes to the business's competitive advantage.

Clearly, it is an indicator that will require future research and empirical testing given that the aim is to capture the way in which ICTs aid innovation. This could be possible by using specific simulation programs, developing computer-aided production systems and even using ICT for creating and strengthening skills (training), which ultimately affects the skills of the business as a whole.

The second dimension relates to skills. Measurement of existing skills within businesses is an extremely difficult task because it involves measuring employees' skills in using ICTs as well as businesses' endogenous skills. Therefore, the proposal includes three types of indicators, which could also be supplemented with indicators of level of formal education and barrier indicators. The percentage of employees using computers is intended to reflect the most basic level of skills, which also assumes that the use of computers implies learning-by-doing processes. This indicator, however, should be analysed carefully given that it may actually be capturing sector specificities. Perhaps a better alternative for analysis would be measuring it in relation to the sector average. In any case, care should be taken when analysing the results.

As the business increases the number of applications (it is expected that the larger the intranet or the greater the number of applications, the greater the server and terminal infrastructure), the creation of an area specifically dedicated to the deployment and maintenance of new applications becomes an imperative —or at least implies a jump in the ICT scale that justifies the cost. In this connection, three indicators are proposed, a

more basic indicator regarding the existence of a systems department and two regarding the activities carried out by this area: maintenance and support and systems development. This latter activity certainly involves more specific skills than the former. In any case, the outsourcing by businesses of the systems area should be considered. However, only if the business has employees capable of selecting, adapting and enhancing these technologies can a greater development of the endogenous skills be possible.

The last dimension is concerned with inputs. Investment indicators are designed to reflect the level of commitment of businesses to ICT adoption. First, expenditure on hardware and software is situated between this dimension and the infrastructure dimension. This is consistent with the time sequence of the business insofar as, first, investments in basic infrastructure (hardware and software) are made, and then, it is possible to capture this infrastructure through indicators. In terms of data collection, this sequence is more difficult to discern and, consequently, surveys are likely to capture the existing infrastructure and the investments made in a same period.

Next come the inputs in training, IT services and systems development. The arrangement of these indicators is intended to reflect the need to invest in different areas throughout the ICT adoption and applications development process. In this same line, perhaps the position of hardware and software should be extended given that it is also necessary to update, restock and improve equipment. However, it is believed that although this kind of investments does not disappear, the level of technological complexity is lower as compared to the level of complexity that systems development or IT services activities can reach.

However, one of the main shortcomings of this type of indicators is the availability of information about the intensity of expenditure. In many cases, there is some reluctance among respondents to provide information related to the turnover or expenditure of the business. One possibility for facilitating international comparison is to ask dichotomous questions (yes/no) and calculate the proportion of businesses that made each type of investment. The problem with this kind of information is that it does not reveal the significance (intensity) of the investments; therefore, it is not possible to distinguish between more strategic investments —which involve larger amounts of money— from smaller ones.

Another shortcoming associated with this indicator is the need to have a uniform definition of ICT products. This is an aspect that is yet to be agreed by the region but that could be facilitated by the already existing definitions (such as the OECD classifications) and by the progress achieved by some statistical offices of the region. In any case, it will be necessary to build consensus in this regard; otherwise, international comparisons may lead to erroneous interpretations.

In sum, the proposed scheme provides a more comprehensive vision of the ICT adoption process and although some correlation between the sequence of ICT adoption and the complexity of these technologies is to be expected, the process will not necessarily take place in sequential stages (see Box 3 below). Given that ICT adoption is related to the needs of the business and its specificities in terms of core activities and strategic decisions, it is possible that each business will follow a specific sequence, combining different levels of complexity simultaneously. For instance, those businesses where design plays a central role are likely to develop applications to support product improvement activities (R&D applications, with an emphasis on the D), which will not necessarily imply a similar level of development in activities related to interconnection with production and sales. In contrast, businesses where customer

service is key are likely to give priority to customer service applications over engineering and industrial design applications.

For international comparison purposes, this type of schemes help understand the distribution of businesses according to levels of complexity, and whether it is a question of skills or greater inputs into in-house developments. Given that in the total aggregate of businesses these specificities disappear, as the structure of production becomes more complex, the proportion of businesses in each of these indicators should increase.

Box 3: A comprehensive overview of ICT use in businesses

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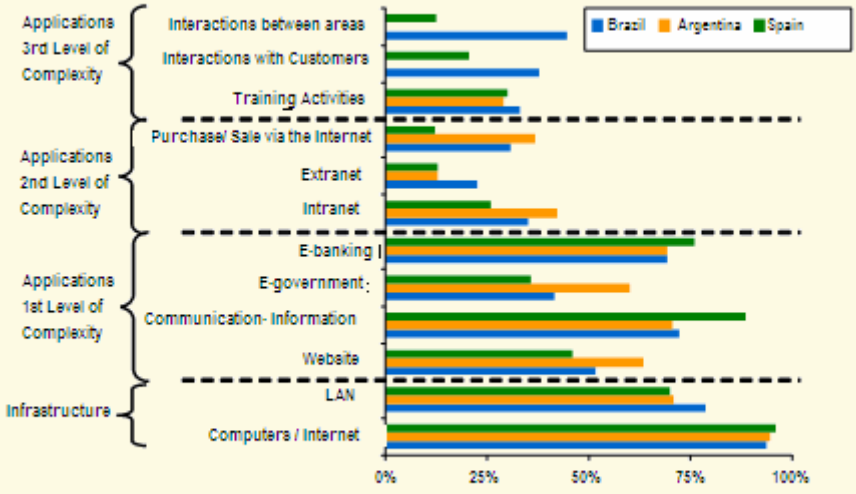
This section intends to illustrate the analysis scheme proposed in Section d(2) above for a selected group of countries. For analysis of the indicators within the Infrastructure and Applications dimensions (unfortunately, the lack of information prevents the analysis of the *Skills and Inputs* dimensions), the variables were regrouped based on the average results for each country. This grouping, albeit arbitrary, provides a more global vision of the level of ICT use and diffusion associated with the different levels of complexity. At the same time, the use of averages minimises the impact of widely used technologies such as e-mail or a website.

Graph 4.1 was prepared based on this regrouping. The distribution of percentages shows that the less complex the technology, the greater the penetration, which also coincides with more narrow gaps between countries at these lower levels. As the technology in question becomes more complex, the gap between countries widens, although not necessarily under the logic of more or less developed countries: in Argentina as well as in Brazil and Spain, computer use and Internet access reach over 90% of the businesses surveyed, which implies that the basic conditions for the transition to the Knowledge Society seem to be present. The case of Brazil is particularly interesting, where the third level of complexity shows a greater proportion of businesses than the second, which reflects the non-linearity of the process.

Graph 4.1: Dimensions - Complexity Relationship



Source: Lugones, Suárez and Moldovà (2008), based on INDEC (2006), CETIC.br (2008) INE Spain (2008) and UNCTAD (2008)

The advantage of this scheme does not lie in the expectation of reaching 100% of the proposed indicators, but rather in the fact that greater complexity is possible only if basic technologies are fully adopted. In other words, only with computers can the business access the Internet; only with Internet access can it use this tool to interact with its environment; only with intranet

systems can the business interconnect its different areas. That is, as the bottom of the graph becomes wider a greater growth in the higher section is to be expected.
In sum, the level of diffusion attained in terms of hardware and basic networks (computers and the Internet) has made stock-related indicators less useful. An indicator that covers 100% of the cases does not say much about the status of businesses in relation to the transition to the KS, and the same holds true for more complex indices that are correlated with GDP per capita. Thus, the analysis of the ICT phenomenon at the regional level can only be possible once progress is made towards an analysis scheme that helps identify trends, specificities and common attributes.

*Based on the document presented during the Fourth Seminar on Knowledge Society Indicators, prepared by Lugones, Suárez and Moldován.

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Chapter 5: ICT Sector

Introduction

According to the Matrix, the telecommunications sector provides the basic equipment and services to establish the networks that allow the connection between different actors and the circulation of information and knowledge. At the same time, the IT industry and high added-value services sector provides the necessary tools to process, manage and store information and generated knowledge. As a whole, the ICT sector is both a result of the KS —in fact, it is one of the so-called high-tech sectors— and an input for its development.

Thus, the analysis of the ICT sector is a key aspect of the study of the KS, on the one hand due to its contribution to the creation of added value and, on the other, because its development has a direct impact on the possibilities of incorporating ICTs in businesses and households.

Given the current advances in the measurement of this particular industry sector, it could be said that it is feasible to make a quantitative analysis of these activities on the basis of a selection among the sector indicators that are currently being generated and, in turn, supplement them with a number of indicators adjusted to the characteristics of the sector, in relation to both the type of goods produced and the region where the businesses are based. Furthermore, it also appears as necessary to supplement these indicators with a reinterpretation of the information derived from “traditional” indicators, taking into consideration the totality of ongoing processes.

AT the IV Ibero-American Seminar for Knowledge Society Indicators, the issues related to the broad classification of ICT goods were discussed, including hardware, software and IT services. Furthermore, it was proposed that a closer analysis of the sector should be carried out on the basis of a greater disaggregation of the activities performed by skilled manpower, whether in the businesses of the sector or in businesses engaged in other activities but having departments that carry out the sector activities. In other words, this implies the broad analysis of the production of ICT goods to be traded or to be used within businesses.

For this to be possible, the first challenge to be faced is the creation of a sector taxonomy. This is a formidable challenge. Traditional classifications are based on the production of tangible goods and despite the advances in the measurement of services, no clear consensus has been reached as to how they should be analysed (and, therefore, measured). In the case of the ICT sector, it will be necessary to overcome the double obstacle posed by the analysis of a sector that produces tangible and intangible goods, as well as services.

a. What is the ICT Sector?

In order to define the ICT Sector it is necessary to explain first what is ordinarily meant by Information and Communication Technologies (ICTs). In this regard, ICTs may be defined as “technological systems by means of which information is received, handled and processed, and which facilitate communication between two or more interlocutors. Therefore, ICTs are more than IT and computers, as they do not operate as isolated systems, but rather in connection with others through a network. They are also more than broadcasting technologies (such as TV and radio), as they not only account for the dissemination of information, but also enable interactive communication” (Katz and Hilbert, 2003).

Thus, the ICT sector is made up of all businesses engaged in the development, production, start-up, support, and enhancement of software and hardware in connection with the handling and processing of information.

Though the ICT sector can be addressed from the perspective of any industrial activity and, so, it should be comprised in the chapter dealing with businesses, the type of goods produced makes them transversal-impact organisations. The ICT sector is the main consumer of these technologies and, therefore, if demand is to be studied, then the same recommendations contained in the above-mentioned chapter are applicable. However, given the above-mentioned transversal nature, its study should be addressed in a specific section.

The foregoing is due to the fact that the study object of the ICT sector is the dynamics of generation, appropriation and spillover of goods. On the one hand, this implies monitoring the sector development from the perspective of industrial organisations, using variables that are as old as widespread: employment, gross product, production value, degree of openness, growth path, etc. On the other, it also implies the study of innovative dynamics, that is, the way in which these businesses seek to develop new goods and services in order to achieve a competitive advantage.

Having said this, it is necessary to establish which are the businesses that are to be studied. Here, definitions become blurred. It is evident that the production of computers or the supply of Internet and mobile phone services are ICT activities, but these also include the supply of software development services through specialised consulting agencies. These two examples alone imply a study object that is substantially different. The matter becomes even more complex when the person rendering specialised consulting services is on the payroll of a business that produces non-ITC goods. The situation of businesses that produce computers (this is the applicable classification under the International Standard Industrial Classification) if production is based on the assembly of imported components (as is the case of ICT maquilas) is also blurred.

Unfortunately, in this regard there are no easy answers or categorical definitions which allow overcoming the obstacles encountered when going deep into a sector in which the level of added value, technological intensity or incorporated knowledge can only be seen when its activities are studied, regardless of the classification applicable to the business in accordance with the end product it trades.

For some countries, classifying businesses according to ISIC categories may suffice, while for others only a greater disaggregation will allow delimiting ICT producers. In any case, the key lies in the assumptions adopted when counting, inventorying or measuring.

Finally, an issue on which consensus does exist is the fact that all countries wish to tap that share of output with high content of information and knowledge, which results in more added value and, therefore, in better salaries and income. The ultimate objective is measuring to what extent these businesses devote efforts to improve the characteristics of the goods, the creation of skills among their staff and the search for a competitive advantage that can drive the development of the country or region where they are based.

b. Why Measure the ICT Sector?

The scenario of productive and occupational change in Western societies is an issue that has been frequently addressed and discussed by academic, business, political and media circles over the last decades. The transition from an industrial society —a

characteristic of development in Western societies over the last three centuries— to a services-based society, with the resulting occupational, productive and organisational changes, was the first focus of academic attention (Bell, 1973).

The increasing weight of the services sector brought about a fundamental change in the productive dimension of contemporary societies. The first distinctive characteristic of this society was evident when knowledge became its critical asset. Mass and continuous production lost ground as the prevailing model, giving way to the generation of knowledge and information, incorporated into tangible and intangible products. As a result, the generation and distribution of knowledge and the development of an information-based economy became defined, statistically sustained study objects.

In this context, while the ICT sector is the main user of new technologies –and as such it should be treated as any other business-, at the same time it is a sector that is transversal to every activity carried out by individuals. Distinct from the role played by the metal-mechanical industry in fordist production, the ICT sector has an impact not only on the production of other goods, but also on the dynamics of the rest of society institutions. In fact, this Manual shows how ICTs are part of every field involved in the dynamics of society.

Therefore, the measurement of the ICT Sector is key to the analysis of the KS. While in countries showing a greater relative development of this sector when compared with other industrial activities this kind of data would allow monitoring it and formulating enhancement policies, in others, on the contrary, this sector appears to be incipient — or to have a low degree of complexity—, which is why having reliable information will allow advancing in the design and implementation of instruments for its development. That is to say, in both situations information is required that not only quantifies the contribution of ICT industries, but also shows their degree of complexity and operation dynamics.

As per López et al. (2003), "the software and information technology services sector is still far from having achieved a stage of technological maturity, while its markets are still undergoing a process of permanent redefinition, which means that new business opportunities are constantly opening up; in other words, in certain areas barriers to entry are still relatively low." As this activity is not capital-intensive, but intensive in skilled labour that is easily relocatable and has extensive possibility for subcontracting, the possibility opens up for developing countries of entering these markets. However, and once again following López (2003), "this change cannot take place spontaneously, but requires public and private initiatives specifically aimed at this objective."

Therefore, the measurement of this type of products becomes a basic input for the formulation, implementation and evaluation of public policies, as well as for decision-making in the private sector. At the same time, the approach to measuring this activity would also contribute to the analysis of the complexity and extent to which own technological developments are generated.

c. How to Measure the ICT?

From the moment ICTs became a key element of the new global dynamics, many countries showed a strong interest in obtaining internationally comparable data which allowed understanding the weight and impact of the new technologies.

In the case of the ICT-manufacturing sector, the first indicators were based on the same assumptions with which the industrial sector was analysed: businesses are classified according to the end product traded and then output is measured. What is

assumed here is that given the same input, the same output is to be obtained and that what happens in between is not relevant for the industrial analysis.

OECD, for example, started to produce information on the basis of the existing statistical sources, applying the definition of the ICT sector and the corresponding set of economic activity sectors related to a selected set of variables, with a view to understanding the contribution of this sector to output and its respective relative share in the aggregate of economic activity.

Now, when the aim of the measurement is to support the design and implementation of policies that promote the development of the ICT sector, this approach is inadequate, if not inappropriate. If what is to be known is the dynamics of ICT businesses, then it will be necessary to address the study object on the basis of an approach that allows knowing the processes.

What was true of old discussions regarding the subject approach v. the object approach in the creation of innovation indicators (RICYT, 2000), is now true of the measurement of the ICT sector. In the countries of the Ibero-American region, attention appears to be focused on the need to capture general inputs (investment, manpower, links, and information sources) rather than the outcome of such efforts. In this regard, this similarity between innovative issues and ICTs is not fortuitous. On the contrary, it accounts for the relevance of the study of innovative dynamics in businesses in general and in the ICT sector in particular.

Therefore, knowing its share in industrial output or the extent to which it is inserted in the dynamics of international trade does not suffice. Both issues, though relevant for the analysis of productive structures, are not sufficient if what is to be known is its potential impact on development. For that purpose, studying the ICT sector means studying the way in which ICTs are produced and distributed, the extent to which these businesses have the potential to drive an improvement in the quality of life of citizens and, particularly, the extent to which the countries of the region are becoming involved in the transition to the Knowledge Society. That is to say, the extent to which Ibero-American economies are actors in the new global scenario rather than mere spectators in the Information and Knowledge Society.

c.1. OECD

The first OECD efforts towards the measurement of the sector focused on the analysis of the production and distribution of ICT goods and services, that is, they were based on a “supply-side” approach which aim was measuring the size and growth of this sector. However, despite the countless data compilations that were made, the lack of a common definition of the sector hindered the desired comparison.

The need to shortly obtain an initial set of core indicators led to the definition of economic activities in the first place, on the basis of the existing classifications, which was later supplemented with a list of goods and services, that is, with a definition of ICT commodities.[39]

[39] In December 2003, after a great number of studies had been conducted by OECD, EUROSTAT and Canada during 1998-2002, the classification of ICT products was approved. The principles guiding the definition are those derived from the following definition of ICT products: "ICTs goods must seek to fulfil the function of information and communications processing by electronic means, including the transmission and display or use of electronic processing to detect, measure and/or record physical phenomena, or to control a physical process." (Roberts, 2004).

It was within the context of these initial steps —contemporary to the extraordinary development of the IT components and software industry, of online electronic content and of e-business and e-commerce processes— that the need arose to advance in the definition and quantification of the relevance of this set of economic activities in terms of output and its growth.

The first step that enabled the construction of measurement indicators for the ICT sector and that, therefore, provided the statistical framework for international comparisons and inter-temporal measurements was taken in 1998, when OECD member countries agreed on a definition of the ICT sector. According to this definition, which was based on the International Standard Industrial Classification, Rev. 3 (ISIC), the ICT sector is "a combination of manufacturing and industrial services that capture, transmit and display data and information electronically" (OECD; 2002a).

On the basis of this definition, which was also adopted by Eurostat, the development of a more detailed classification of the different activities that make up the ICT Sector was started and later revised in 2002. Table 5.1 is a summary of the original version and its subsequent revision.

Table 5.1.: Classification of the ICT Sector (OECD)

ISIC Rev. 3.1	ITC Manufacturing Sector
3000	Manufacture of office, accounting and computing machinery
3130	Manufacture of insulated wire and cable
3210	Manufacture of electronic valves and tubes and other electronic components
3220	Manufacture of TV and radio transmitters and apparatus for line telephony and line telegraphy
3230	Manufacture of TV and radio receivers, sound or video recording or reproducing apparatus and associated goods
3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except for industrial process control equipment
3313	Manufacture of industrial process control equipment
	ICT Services Sector
5151	Wholesale of machinery, equipment and supplies
5152	Wholesale of electronic and telecommunications parts and equipment*
7123	Renting of office machinery and equipment (including computers)
	ICT Intangible Goods Sector
6420	Telecommunications
7200	Information Technology and related activities

* Included in the 2002 Revision. ** In the 2002 version, the services related to intangible goods and services were grouped into “ICT services” only category.
Source: OECD (2002b, 2005)

According to the principles on which this classification was based goods “must be intended to fulfil the function of information processing and communication, including transmission and display; use electronic processing to detect, measure, and/or record physical phenomena or control physical processes” and, in the case of services industries, they “must be intended to fulfil or enable the processing of information and communications by electronic means” (WPIIS; 2003).

The resistance to the OECD classification, evidenced by its subsequent revisions (the classification was revised in 2002 and 2005), focused on the recognition of the existence of ICT products manufactured by businesses that did not fit into the

classification and on the extent to which the manufacturing sector overlapped the content sector.

The agreement reached consisted of a working plan having two stages, during the first of which advances would be made in the definition of the sector producing goods and services, while the definition of the sector producing content would be addressed during the second. Eventually, advances could thus be made towards a more accurate definition of what is defined as "knowledge economy" (OECD, 2007).

After the UN ISIC revision (ISIC Rev.4) —the basis for the ICT classification— made between 2006 and 2007, the WPIIS focused on the improvement of the sector definition and in the 2007 version of the Guide to Measuring the Information Society a more accurate definition was included which contained both the businesses producing ICTs directly and those in which ICTs were a by-product; the definition of content-producing businesses; the businesses that traded these goods; and a discussion on ICT-related patents.

As in prior discussions, the key to a definition of the ICT sector lay in the need to draw up the list of products that would be defined as ICT, on which basis the sector would then be delimited so as to be consistent with the classification proposed in UN ISIC Revision 4., which would facilitate international comparability and the adoption of similar classifications, both in member countries and in those that were not (OECD, 2007).

Thus, in the above-mentioned Guide two chapters dealing with this issue were included: one on ICT products and the other on the ICT sector, as well as two annexes containing details about the classifications, discussions and limitations to the approach. Furthermore, it was admitted that the intersection between the definition of ICT products and ICT sectors is not perfect, basically because the statistical units classified as ICT sector do not produce ICT goods only and, inversely, ICT products can also be produced by non-ICT businesses.[40] The former case would comprise the sector producing office equipment (which also produces typewriters), while the latter would comprise diagnostic imaging equipment, generally produced by the sector producing medical equipment.

Allowing for the limitations of the foregoing cases, the Guide introduced a set of core ICT sectors. In 2007, it was agreed that the first guiding principle of the sector definition should be modified and that businesses that were mainly oriented to processing and communicating information by electronic means, including broadcasting and display activities, would be classified as ICT-manufacturing businesses. This new classification, which was stricter (in part as a consequence of the resulting ISIC), excluded from the classification businesses producing measurement, testing, navigation and control equipment, as well as optical fibre (Table 5.2.).

[40] Due to this, between 2008 and 2009, the Guide has been under revision –basically as to the classification of ICT goods– and a new edition is expected to be released by the end of 2009.

Table 5.2.: Classification of ICT- Manufacturing Industries (OECD)

ISIC Rev. 4	ICT- Manufacturing Sector
2610	Manufacture of electronic components and boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
3230	Manufacture of magnetic and optical media

Source: OECD (2007)

Regarding ICT goods produced for "own use," part of the information is collected on the basis of the ICT analysis of ICTs from users (ICTs in businesses) and is intended to address this goods production method in future discussions.

Regarding ICT-related patents, the Guide describes the limitations implied in the use of patents for the definition of the ICT sector, particularly because not everything that is patented is produced, not everything that is produced is patentable, and not everything that is patentable gives rise to a property right. However, given the volume of information available, a scheme is suggested for the interpretation of information on patents, which are selected on the basis of a new ICT classification more closely related to the sector classification and based on the International Patent Classification (IPC) rather than on the basis of the products themselves. Such list is shown in Table 5.3. below.

Table 5.3.: Definition of ICT-Related Patents (OECD)

IPC Code Rev. 01/2007	Telecommunications
G01S	Radio Navigation
G08C	Transmission systems for measured values
G09C	Ciphering apparatus
H01P, H01Q	Waveguides, resonators, aerials
H01S003-025, H01S003-043, H01S003-06, H01S003-085, H01S003-0915, H01S003-0941, H01S003-103, H01S003-133, H01S003-18, H01S003-19, H01S003-25, H01S005	Semiconductors lasers
H03B-D	Generation of oscillations, modulation and demodulation
H03H	Impedance networks, resonators
H03M	Coding, decoding
H04B	Transmission
H04J	Multiplex communication
H04K	Secret communication
H04L	Transmission of digital information
H04M	Telephonic communication
H04Q	Selecting, switching
	Consumer Electronics
G11B	Information storage with relative movement between record carrier and transducer
H03F, H03G	Amplifiers, control of amplification
H03J	Tuning resonant circuits
H04H	Broadcast communication
H04N	Pictorial communication, television
H04R	Electromechanical transducers
H04S	Stereophonic systems
	Computers, Office Machinery
B07C	Postal sorting
B41J	Typewriters
B41K	Stamping apparatus
G02F	Control of light parameters
G03G	Electrography
G05F	Electric regulation
G06	Computing
G07	Checking devices
G09G	Control of variable information devices
G10L	Speech analysis and synthesis
G11C	Static stores
H03K, H03L	Pulse technique, control of electronic oscillation or pulses
	Other ICTs
G01B, G01C, G01D, G01F, G01G, G01H, G01J, G01K, G01L, G01M, G01N, G01P, G01R, G01V, G01W	Measuring, testing
G02B006	Light guides
G05B	Control and regulating systems
G08G	Traffic control systems
G09B	Educational or demonstration appliances
H01B011	Communication cables
H01J011, H01J013, H01J015, H01J017, H01J019, H01J021, H01J023, H01J025, H01J027, H01J029, H01J031, H01J033, H01J040, H01J041, H01J043, H01J045	Electric discharge tubes
H01L	Semiconductor devices

Source: OECD (2007)

Regarding the trade of ICT goods, the debate held by the specialists of the WPIIS focused on the wholesale and retail sale of these goods. According to the position agreed by this group, wholesale dealers of computers, peripherals, software, electronic and communication equipment should be included, while retail dealers should not. The argument supporting this position was the fact that in some member countries there were businesses that produced goods in one country but traded them in another. Thus, a business such as "IBM must be included in the ICT sector in all countries, regardless of the relative importance of their ICT activities (manufacturing, software development or IT services)" (OECD, 2005).

Though at first it was held that it would be convenient to keep wholesale businesses that traded machinery and equipment and retail businesses within this sector, for the sake of statistical consistency, -it was too broad a definition in the former case and it was not representative in terms of its output share in the latter- it was agreed that it should be superseded. Thus, it was decided that the ICT trade sector would be made up of two of the above-mentioned industries, as summarised in Table 5.4.

Table 5.4.: Definition of ICT Trade industries (OECD)

ISIC Rev. 4	ICT Trade Sector
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts

Source: OECD (2007)

Regarding the classification of ICT services, though ICT goods and services were developed at the same time, given the traditional greater relevance of the classification of goods, the definition of indicators related to services lagged behind the definition of those related to goods. Even greater was the backwardness regarding the classification of content-generating sectors. Even so, given the increasing importance of both sectors, and recognising that they should be included in the ICT sector, OECD proposed a classification for both.

The first classification of ICT services was made at the same time as the classification of goods and according to the principle supporting it, said services must be intended to enable the function of processing and communicating by electronic means.

During the 2006/2007 revisions, discussions focused on the distinction between ICT services and the production of content, particularly regarding the distribution of software designed for educational purposes, information or entertainment and broadcasting activities (given the impossibility of differentiating content-generating activities from release activities). At the same time, consensus was rapidly reached regarding telecommunications, programming, hosting and information services. Finally, agreements were reached on the basis of a combination of the possibilities arising from the UN classification (for instance, software distribution does not describe the program features) and the possibilities given by the state of the art (for instance, in the future new broadcasting means will allow differentiating release activities from generation activities). In Table 5.5 the final list of selected ICT services industries, as well as its ISIC Rev. 4, are shown.

Table 5.5.: Definition of ICT Services (OECD)

ISIC Rev. 4	ICT Services
5820	Software publishing
61	Telecommunications
62	Computer programming, consultancy and related activities
631	Data processing, hosting and related activities; web portals
951	Repair of computers and communication equipment

Source: OECD (2007)

The measurement of the content-producing sector is even more recent than the measurement of the services sector, and though the need to have a definition of this sector was recognised as early as 1998, it was not until the 2006/2007 round of revision that a definition broad enough to include the various types of content, but narrow enough to prevent ICT services that had already been classified from overlapping was agreed. It was then decided that according to the principle that would guide the classification of the content sector any industry in which the "production of goods and services was mainly aimed at informing, educating or entertaining individuals through the mass media" would be included in this category. Therefore, it comprises all businesses oriented to "the production, publication or distribution of content (information, educational, cultural or entertainment products) understood as an organised message intended for human beings."

On the basis of this guiding principle, during the WPIIS meetings, discussions addressed the industries that would be included, resulting in a classification that differentiates written content publication activities from activities related to films, videos and TV programs and the publication of sound content and broadcasting activities (Table 5.6.).

Table 5.6.: Definition of Content Industries (OECD)

ISIC Rev. 4	Content Industries
581	Publishing of books, periodicals and other publishing activities
591	Motion picture, video and television program activities
601	Radio broadcasting
602	Television programming and broadcasting activities
639	Other information service activities

Source: OECD (2007)

Thus, for OECD, the ICT sector is made up of four types of industries: industries producing goods, industries supplying services, wholesale trade industries (though their inclusion is due to the existence of producing and trade industries) and content-producing industries. These four sectors make up what the Guide calls information-based economy, suggesting that they should be measured and monitored.

Though the variables that were to be monitored were not submitted to the consideration of the WPIIS, the Guide contains a summary of the information that should be collected: capital expenditures, employment, number of businesses, production, research and development, added value, salaries, the sector added value and employment generated by the sector.

c.2. EUROPEAN UNION / EUROSTAT

For the European Union, the measurement of the ICT sector is a key aspect, as it is recognised that this sector has the potential to fulfil the objective set in the Lisbon Strategy within the framework of e-Europe 2002: turn the region into "the most competitive and dynamic knowledge-based economy worldwide, capable of growing on

a sustainable basis, with more and better jobs and greater social cohesion by 2010" (EC, 2000). On the basis of this objective, the second objective set in the i2010 was "strengthening innovation and research on ICTs, as these are the main driving force of the economy" (EC, 2005a).

In this context, the importance of the ICT sector lies in its dynamism as a sector in itself, in its impact on the general productivity of other sectors and in the improvement of the conditions of incorporation of ICTs in other sectors of society, given the lower price of these goods as capital and labour productivity gains are linked.

For the measurement of the ICT Industry in the European Union, Eurostat has adopted the same classification proposed by the OECD in 1998 and in its 2002 revision. However, it appears not to have incorporated the 2006/2007 revision, as in the 2008 assessment of the i2010, the sector analysis is presented according to the 2002 OECD revision categories. This implies that benchmarking indicators do not comprise those designed for the measurement of the content sector, and though the 2006 recommendations suggested advancing in that direction, the 2008 report advanced only in the description of said industry within the software and IT services sector without giving details on the above-mentioned sector. However, given the obvious concern for content generation (which can be seen, for example, in the questions of household surveys about the Internet applications), subsequent assessments of the i2010 are likely to be included in the new OECD classification.

Once the OECD classification was accepted, efforts were focused on the generation of indicators capable of accounting for the triple impact of the ICT sector: the growth of output and investments, productivity gains (of both the sector and the industry) and price reduction. At the same time, "as it is a broad and diffused sector that contains many different economic indicators that can provide problem signs regarding the size and direction of the activity," it was considered necessary to advance in the specification of a particular set of core indicators (EC, 2005b).

The set of indicators proposed in the 2006 benchmarking scheme was distributed throughout the three objectives of the i2010 –"create a European information space, reinforce innovation and investment in research on ICTs and promote inclusion, public services and life quality" (EC, 2005a)-, though, of course, they focus on the second one.

Despite the relevance given to the sector, the original set of benchmarking indicators is notably small, allowing the analysis of only the dynamics of production, employment and the creation of value (Table 5.7). Though aiming at advancing in the analysis of the impact of the sector on the domestic market (barriers to entry, bottlenecks or competition problems), on the productive structure and on the use of advanced applications (the change in users' behaviour), the recommendations suggest conducting specific studies without proposing the necessary indicators (EC, 2006).

In the 2008 assessment a new indicator was incorporated (exports share) and though it was not placed at the same level of benchmarking indicators, information on imports was also included and the software and IT services sector was analysed separately. Moreover, a separate section on content development was included, though the information there presented was derived from domestic studies of qualitative characteristics rather than from comparable indicators among member countries.

Table 5.7.: i2010 Benchmarking Indicators (Eurostat)

ICT Sector
ICT sector share of the economy as % of GDP
ICT sector share of the economy as % of overall employment
ICT sector growth as % of change in added value, in constant prices
% of ICT exports on total exports*

* Indicator included in the 2008 assessment.
Source: EC (2006 and 2008)

The information sources for these indicators are various. For growth and investment aggregate indicators, the information was derived from specific industrial surveys (such as the *EUROSTAT Structural Business Survey)* and from national accounts measurements. The indicators related to innovative dynamics were derived from specific sector studies, from innovation surveys and from R&D surveys.

Summarising, the interest of Eurostat in the measurement of the ICT sector lies in the need to reach the levels of dynamism of countries such as the United States and Japan (investment levels, productivity gains) and it is in that direction that the sector development is monitored. Though there are partial reports (national or sectorial) dealing with software production monitoring, content development and the supply of ICTs services in general, the set of benchmarking indicators for the issue in question is restricted to information on outcomes (total output, employment, added value) rather than on processes. Therefore, if indicators such as the above were applied in the region, even if we were able to confirm that it is producing lower levels than those produced in the European Union (a statement which need not be supported by many indicators), we could not address the issue of how such a sector behaves and is fostered.

c.3.UNITED NATIONS / ECLAC / OSILAC

From the perspective of Latin-American countries, the development of the ICT sector is a means for advancing towards bridging the historical foreign gap, as well as improving the level of income, the level of technological development and the quality of employment. There is no doubt that the greater the sector added value, the better the possibility of generating virtuous spillovers for the rest of society.

At the San Salvador Commitment, the ministers of the Latin-American countries agreed "to promote cooperation among universities, vocational training institutions and the private sector in order to deepen scientific knowledge and strengthen the ICT industry in the region" (ECLAC, 2008). This implies recognising both the potential of the ICT sector and the degree of development reached by scientific and technological institutions, many of them of long standing.

Though it has a relevant place in the statement of the above Commitment, the development of content and new ICT applications is not addressed as a sector problem but as a potential tool for inclusion and the improvement of living conditions. Thus, the statement included such objectives as "seek to establish a regional market for digital services and content (in education)" or "promote the creation of special-priced baskets of appropriate content digital services for socially vulnerable sectors" (ECLAC, 2008).

Now, besides the above statement of objectives, and with the specific purpose of measuring the development of the ICT sector as part of the productive structure, the countries of Latin America and the Caribbean use mainly the set of recommendations, classifications, variables and indicators established by the Partnership on Measuring

Information and Communication Technologies for Development, a working group that comprises such institutions as ITU, OECD, UNCTAD, UNESCO and ECLAC.

The general objective is to take advantage of the work carried out by OECD regarding the sector definition and, on this basis, identify the weight of the ICT sector in terms of business volume, added value and employment for the economies of Latin America and the Caribbean. It is, basically, a slice of the statistical information related to the variables aiming at a set of constant economic activities in the ICT sector. For this work to be successfully accomplished, it is essential to have databases resulting from surveys to businesses that provide plenty of detail on ISIC sections and sub-sections. This is not an easy task in terms of the construction of indicators, as the information available regarding businesses is not adequately representative at a national level to admit a greater degree of openness to the ISIC's three digits.

Despite their potential limitations, the advantage of these proposals lies in the construction of indicators for monitoring and systematically comparing the development of the ICT sector in the context of the countries of Latin America and the Caribbean, as well as for international benchmarking activities.

If the necessary statistical information were available, another objective would be setting the values obtained for each of the variables referred to above in terms of their segmentation into the manufacture and services categories incorporated in the ICT sector. The Partnership's recommendations are based on the OECD classifications, and though the list of indicators in effect is based on the 2002 revision —just as the ISIC referred to above is version 3—, its update is likely to include the changes of the 2006/2007 revision (in fact, in the document it is stated that as from the ISIC revision modifications will be introduced) (Partnership, 2005).[41] Table 5.8. summarises the recommendations of this organisation regarding the ICT sector measurement.

Table 5.8.: Recommendations on the ICT Sector Measurement (OSILAC / Partnership on Measuring ICT for Development)

Core Indicators on ICT Sector
Proportion of total business sector workforce involved in the ICT sector
Value added in the ICT sector (as % of total business sector added value)
Core Indicators on Trade in ICT Goods
ICT goods imports as % of total imports
ICT goods exports as % of total exports
Sources
Business surveys
National accounts system
International databases (for example UN Comtrade).

Source: Partnership (2005)

As it can be seen, the indicators proposed are similar to those used for the i2010 benchmarking and, therefore, they have the same limitations. For the Ibero-American region, analysing and defining their behaviour is as important as knowing the development of sales and exports (outcome measures) in order to identify policy areas and, particularly, successful cases. If this were possible, if businesses could be characterised as having sound policies and practices in the technology, labour,

[41] It should be noted that at the Global Event on Measuring the Information Society, also organised by Partnership and held in May 2008, the lists of inidicators agreed upon –among which were those regarding the measurement of the ICT sector– were discussed and updated. However, the recommendations of OSILAC are still based on the previous meetings, as by that time the round of revisions and agreements for the new set had not been completed. The proposal is available at http://new.unctad.org/templates/Event 888.aspx.

productivity and exports sectors, then it would be possible to advance in the formulation of a policy that may reproduce such cases and, therefore, increase the sector share.

d. Towards a Strategy for the Analysis of the ICT Sector for Ibero-America

From the foregoing paragraphs it can be seen that great advances have been made towards the standardisation of the classification of the different agents involved in the ICT Sector. This, in turn, has led to the formulation of a relatively homogeneous definition and a basic set of core indicators that can be internationally compared and whose construction does not require great efforts in terms of resources and skills.

However, it should be noted that the proposals for the classification of the ICT Sector (even in their current version), appear to have a bias towards manufacturing and business services which is not adequate for the proper inclusion of activities related to software production understood as a specialised, high added-value service.

This means that the definition of a measurement strategy for Ibero-America should start from the existing definitions and classifications but, in turn, advance towards the formulation of a basic set that enables the measurement of the ICT sector not only in terms of its impact on the economy but also in terms of its complexity, the distinction between hardware and software, the degree of coordination between the supply and demand of technologies and its relation with the supply of knowledge. In other words, the extent to which it adds to the development of society. Thus, this type of information should account, for example, for the quality and size of the labour force engaged in the production and supply of high added-value services, the type of hardware/software produced and the extent to which this sector has a demand that can drive advances in the complexity, or to put it in other words, the obstacles it faces and its real possibilities of development.

This type of activity is precisely the one prevailing in Ibero-America and, particularly, in Latin America and the Caribbean, where software production that can be traded as a close, standardised package, plays a marginal role, as does the manufacture of equipment and components -hardware.

At the same time, and as noted before, it will be necessary to advance towards a classification of ICTs which allows capturing the level of actual technological complexity of the activities developed by these businesses. In contrast to the limited relevance that the presence of businesses that design in one region (generally these countries) and trade in others (generally our countries) has for developed countries, in Ibero-America the distinction between these activities is quite relevant. Naturally, it will not be the same in terms of added value, skilled labour and spillover whether IBM trades, designs or produces. On the contrary, it is precisely this lack of distinction between the activities carried out by international businesses that has caused direct foreign investment attraction policies to have a lower impact than expected.

Another type of activity that is not deemed to be relevant in OECD classifications is the production of ICTs for own use. During the IV Seminar evidence was submitted which suggests that this type of developments are as important for the generation of competencies and skills as those that may be generated in a business under the ICT producers category (See Box 4). Naturally, the inclusion of these measurements would imply a change in the interpretation of indicators: the object of measurement would no longer be the ICT Sector but the production of ICT goods. In this regard, the greater usefulness of indicators (in the light of the above heading “why measure”) would be to the detriment of international comparability.

Another regional specificity (especially for Latin America and the Caribbean) is the need to put the development of ICT content at the service of the citizens' welfare. In this case, the development of content "aimed at including the most vulnerable population" or at adding to "the regional development of content in education" is not likely to be translated into a greater share of ICT added value of the total output or employment level, particularly as it is usually addressed by public institutions. However, the fact that its impact is not direct (or cannot be measured directly), does not undermine the importance of having indicators showing its development.

In sum, based on the experiences and recommendations put forward at the IV Seminar, it is considered imperative to recommend supplementing the classifications proposed for adoption with the inclusion of additional items or categories in order to construct indicators that account for the above-mentioned aspects. It is clear that this should not affect in any manner the task of reconciling the regional statistical system with international practices but, once again, if perfectly comparable indicators confirm what is obvious, then their usefulness is limited and the possibility of reaching consensus is scarce. Inversely, if national strategies are measured with regional indicators, the possibility of reaching homogeneity are higher and indicators are no longer an aim in themselves, but the starting point for social and economic improvement.

Box 4: Monitoring Human Capital as a Procedure for Estimating Software Activities and IT Services

Virginia Costa Duarte*

Though software activities and IT services are performed as the principal source of sales by the businesses included in Division 72, "Computer and related activities," of the 1.0 version of the National Classification of Economic Activities (CNAE), based on the International Standard Industrial Classification (ISIC) Rev. 3.1, it is known that a significant part of these activities are also performed by businesses categorised in other economic sectors. In these sectors, software activities and IT services are performed with different purposes. They include the development of software for own use (improvement of production and management processes), the supply of services of greater added value and trade as a secondary source of income. IT teams are also available to supply maintenance and support to internal users.

In order to know the intensity with which software activities and IT services take place in sectors other than the above Division 72 or the ICT Sector, the **SOFTEX Observatory**, the research division of SOFTEX Corporation, designed a methodology based on monitoring human capital, specifically, the professionals employed who perform duties related to software and IT services (PROFSS). These duties were selected from a number of occupations listed in the Brazilian Classification of Occupations (CBO), based on an international occupation register. The collection of data was based on the Annual Relation of Social Variables (RAIS) of the Ministry of Labour and Employment of Brazil (MTE/Brazil), an annual administrative register that operates as a census. The number of PROFSS for all economic activities is surprising: it is four times as high as the number of PROFSS having jobs in Division 72.

The inclusion of a question in the 2005 Annual Survey of Industry (known by its Portuguese initials, PIA), conducted by the Brazilian Institute of Geography and Statistics (IBGE), confirmed the development of software for own use in the industrial sector: it takes place particularly in ICT sector businesses, though it also occurs in other sectors. Even though the survey did not include the services sector, it is known that the number of PROFSS in many of these sectors, for example, in the Financial Intermediation Division and the Services Supplied to Businesses Division, is high. In Brazil, the Public Sector is also an important employer of PROFSS.

The conclusions of the survey conducted by SOFTEX Observatory are included in the 2008 Edition of the publication **Software and IT Services: Brazilian Industry in Perspective** (In Portuguese "Software e Serviços de TI: A Indústria Brasileira em Perspectiva") and further information is available at: www.softex.br.

* Based on the presentation made at the IV Ibero-American Seminar for Knowledge Society Indicators and the preliminary document "Software e Serviços de TI: A Indústria Brasileira em Perspectiva" of the SOFTEX Observatory.

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Chapter 6: ICT Access and Use by Schools

Introduction

At the seminar, a proposal was made to include a specific chapter dealing with "Education" in the Lisbon Manual. Though the importance of this dimension of the Knowledge Society will be shown throughout this chapter, suffice it to say that if the key resource of this new society is knowledge and this is generated, improved and disseminated among people, then the training of human resources from the initial stages and the way in which these learn with and from ICTs is the starting point for what in the businesses row is called ICT specialists and in the households row, basic and qualified ICT users.

Naturally, this slice of educational reality does not include higher educational institutions. Nevertheless, the slice is not fortuitous. Its objective is to assess to what extent ICTs are taught and learning takes place with ICTs. The study of the characteristics that both processes take on at the initial educational levels accounts for the average degree to which citizens have access to the other ICT benefits in their adult lives. It is evident that higher education also plays a key role in the creation of skills, though it is accepted that this should be discussed separately from basic education, which is why it has not been included in this chapter.

Within the framework of the methodological approach proposed, the inclusion of this chapter is an initial step towards opening the row "other institutions." In this case, it the aim is to deal with what is defined as the "schools" sub-row. Given the more recent consideration of this topic in the context of the activities of the Lisbon Workshops –but also among other international institutions that have addressed this topic– the degree of advance and consensus reached is lower. Therefore, so is the extent to which it will be discussed in this chapter vis à vis the foregoing five chapters. Of course, the fact that here it has not been extensively developed does not mean that it is less important in the study of the KS. On the contrary, its inclusion, though incipient, seeks to lay the foundations for the growth of this topic within the Sub-net, which may be further supplemented with the advances that have taken place in the other categories addressed by RICyT.

a. What is the "schools" Sub-row?

Measuring the transition to the Information Society in educational institutions means knowing the degree to which their students, teachers and administrative staff have access to ICTs. This implies not only measuring the number of computers per school and the level of access to Internet, but also the use of these tools. In terms of the Matrix, it implies measuring infrastructure, efforts, applications and skills in the "scope of formal primary and secondary education (…) both public and private or cooperative" (Alves, 2008).

Regarding the actors, the proposal implies a triple approach to this phenomenon. On the one hand, as the main communicators of knowledge are teachers, their use of ICTs refers to their qualifications to deliver such knowledge to students. To say it simply, if the teacher is not an ICT user, he will not likely be able to teach his students to be one.

The second approach addresses the students. Analysing the transition to the KS among this particular population implies generating information that may account for the extent to which students learn with and from ICTs. This implies recognising the dual role these technologies play in the learning process. On the one hand, they are a type

of knowledge that must be increasingly included in school curricula. If the school is the place where individuals are trained for their future working life, then they should also be trained to use these tools. Summing up, as technology advances, digital education becomes a key requirement to interact in the private and labour spheres (be it sufficient to think, for instance, about the basic set of skills required to operate automatic teller machines, buy from vending machines, receive an e-mail or send a text message).

According to Alves (2008), new professions, skills and attitudes in the face of the process that is taking place imply the reconfiguration of teaching and learning processes. Therefore, it will be "necessary to adjust all educational levels to the skills that at present are deemed to be essential for life, work, consumption or leisure in the "Information Age."

The second role played by ICTs is that of facilitating learning processes. Technological advances have allowed the development of more didactic, multimedia and interactive teaching methods. This second role, in turn, is closely related to teachers' ICT skills. In this regard, teachers are the skilled workforce responsible for teaching both ICTs and other content pertaining to the first educational levels.

Finally, the third approach is related to the use of ICT tools for improving efficiency in educational management. This third dimension of ICTs in the area of education is perhaps the least important in the light of the objectives of this chapter, especially, because it is closer to their use by businesses than to the impact of KS on learning processes. For this reason, attention will be focused on the relationship between ICTs and teachers, ICTs and students, and between both relations, on ICTs in the learning process. Nevertheless, given the potentiality of their measurement as an instrument for improving the performance of these institutions, some recommendations and key revisions to approach them will be included.

b. Why Measure the "Schools" Sub-row?

For countries having a lower relative development, education is a strategic area in the transition towards the Information and Knowledge Society; it is the means *par excellence* for bridging the so-called digital gap. Particularly, in those countries where connectivity is low and access to computers is limited, it is in schools where the generation of ICT skills is possible.

Essentially, education is the basis for the acquisition of the skills required for full participation in this new society, not only because it allows individuals to use ICTs, but also acquire the necessary skills to compete in labour markets (Alves, 2008).

Similarly to what is true for the other rows of the Matrix, the measurement of this phenomenon, which is the element that will allow knowing the extent to which these institutions are taking advantage of the potential of new technologies, will expectedly allow knowing which are the aspects that require the development of policies that foster the use of ICTs and allow overcoming the obstacles posed by their implementation. In this regard, public policies are the agent capable of promoting investment (efforts) in the creation of infrastructure, the generation of skills (training) and the development of applications (generation of virtual educational networks). In any case, and regardless of the complexity of the tools related to the policies, it will be necessary to establish their starting point and monitor their development.

For the countries of the region, monitoring the way in which schools advance towards the Knowledge Society is a way of projecting the progress of the digital gap, of identifying future bottlenecks and of improving the conditions for their use and access

among the general public. The ICTs skills that are developed today are those that may be enhanced and transmitted tomorrow.

For this reason, it is essential "to define a set of core indicators that account for the changes occurred so far and that enable a diagnosis and the validation of the advances made and the obstacles identified at the domestic and international levels" (Alves, 2008). In the case of the Ibero-American region, the creation of such basic set and the possibility of expanding it to cover most phenomena is a challenge facing multiple incompatibilities but, at the same time, multiple advantages.

On the one hand, it can be seen that different relative levels of development lead to the existence of different educational and non-educational problems that have an impact on institutionality and learning processes. On the other, the specific historical, cultural and linguistic paths require greater attention to the processes that are common to the region. Consequently, the measurement and characterisation of the use and dissemination of ICTs in schools is an input not only for the generation of policies for the transition to the KS, but also for the creation of tools and content that recognise said paths and specificity (Alves, 2008).

c. How to Measure the "Schools" Sub-row?

The analysis of the advance of Information Society in the educational area requires measuring not only the penetration, but also the use and obstacles faced by the actors (students and teachers) regarding ICTs in particular and the transition to the KS in general.

For that purpose, the "Internet penetration rate" in schools provides little information about their situation in connection with the phenomenon under examination. A high penetration rate will be of no use if the number of computers per student is limited, if there are no computer labs and if teachers are not users of these technologies.

In this regard, the various organisations engaged in measuring and generating consensuses have advanced in the creation of a set of core indicators that may account for the reality of educational processes and their relation to ICTs. Nevertheless, despite their importance as a space for digital education and training in the basic skills related to this new economy, the effective measurement and existence of comparable indicators is limited.

Advances in this field have been scarce and no proposal has been made or agreement reached as to a form, beyond the traditional survey forms on primary and secondary education, where in some cases, ICT questions have been included. Below are the various approaches and sources of information on which the existing measurements and analyses are based.

c.1. OECD

In line with the importance given to the development of systems of internationally comparable indicators for the formulation of social and economic development policies, the OECD Directorate for Education has been increasing efforts for the development of internationally comparable indicators. These efforts are reflected in the publication "Education at a Glance," which has been published annually since the beginning of this century and which describes the general situation of each member country. The analysis of the dissemination of ICTs in schools is one of the aspects that are surveyed

and, unlike what happens with the other rows, no basic set or recommendations have been agreed for the systematic generation of said information.

Despite sustained efforts in the search for comparable indicators, national specificities in the field of education make this task difficult. Particularly, it is to be noted that "while indicators must be as comparable as possible, they must also be as country-specific as necessary in order to capture the issues related to historical, systemic and cultural differences among the countries" (OECD, 2008).

The information collected in these publications is derived from two types of sources: surveys to students and teachers, conducted at a regional level (including the Programme for International Student Assessment, PISA) and the information generated by the Ministries of Education of each country.

The methodological approach to this phenomenon is based on two dimensions: infrastructure and impact. The former arises from secondary sources or ministerial reports from which the traditional stock indicators (number of computers with Internet access, student-to-computer ratio, etc.) are derived. The latter arises from a survey on education (PISA) in which ICT questions have been recently included.

Through PISA survey, OECD collects information about the knowledge and skills of fifteen-year-old students in a number of developed countries. Table 6.1 shows a summary of the survey on ICTs included in PISA 2006. As it can be seen, this survey collected information on access to ICTs by teachers and students (availability of computers, Internet and local networks), as well as on access locations, type of activities developed and the assessment of the skills required to carry them out. Furthermore, a set of questions intended to assess the IT applications introduced (text processors, spreadsheets and browsers), teachers' qualifications in the use of ICTs (training courses and specific skills) and the integration between ICTs and school processes was included.

Table 6.1.: ICT Survey at Schools (PISA-OECD)

Model Form		
Survey / Respondent	Survey questions	Survey Information
Students	Personal computers	Usage, frequency, access location, activities and skills.
	Household access	Computers, specific software, Internet access, mobile cellular phone, television.
	Reference indicators	Age, sex, parents' educational level, household infrastructure.
School	Infrastructure	Number of computers, computers available for instruction, computers with Internet access, infrastructure problems (inadequate or inappropriate equipment).
	Reference indicators	Enrolment, type of management (public or private), instruction level, locality

Source: OECD (2007a)

As it is a survey that also collects information on the family background and, of course, on the school characteristics (skills in language and mathematics, characteristics of the teaching staff, schooling ages, etc.) analyses are then made on the use and dissemination of ICTs according to a selected set of features, which has allowed,

among other things, establishing an association between the use of these tools and the students' skills.

In the Guide to Measuring the Information Society (OECD, 2007b) while the analysis of the relationship between ICTs and schools is dealt with only in one section, it is admitted that it is necessary to advance in the measurement of this phenomenon. In this regard, it is held that the OECD Directorate for Education has been working with member countries since 2001 in the creation of a common questionnaire that enables the measurement of the use of ICTs by students and teachers. The document released in 2004 consists of a revision by the International Survey of Upper Secondary Schools (OECD, 2004) intended to deepen the measurement that has been done on the basis of PISA survey. The agreements reached on the method to be used in the common measurement are expected to be unified in future PISA editions (possibly the 2012 edition) so that advances are made in the creation of a set of survey questions intended to assess the skills for using computers and ICT literacy levels.

c.2. EUROPEAN UNION / EUROSTAT

The so-called Lisbon Strategy in 2000 already emphasised the special importance of education and specified that cooperation among the EU countries on issues related to education and training was a basic need to turn the region into a knowledge-based leading economy. In this context, several action plans intended to fulfil the objectives proposed were formulated, among them supplying connectivity to Internet to all schools, training all students in ICTs upon completion of compulsory education, training European teachers in digital technologies, developing European software and educational services and accelerating the incorporation of schools and teachers to the networks[42].

Both eEurope and current i2010 action plans refer to the role of ICTs in education. Yet, they are not deeply discussed, even though it is admitted that education is "the key to inclusion in the Knowledge Society" (EC, 2006a). In this regard, "the European policy tepid implication for the Information Society regarding the incorporation of ICTs in education is consistent with the limited efforts made in the systematic statistical measurement" (Alves, 2008). In fact, the measurements and analyses were derived from the information collected by PISA without specific measurement instruments.

This statistical and methodological limitation was noticed by the teams responsible for the i2010 benchmarking in 2007 and as a result a specific survey was recommended in order to gather information on the use of ICTs in European schools, the student-to-broadband Internet access computers ratio and the proportion of teachers who use computers in the class (EC, 2006b).

Though the methodological framework of i2010 benchmarking indicators does neither contain a basic set nor recommendations in this regard, a study published that same year included a sort of homogenisation of methodological guidelines and questionnaires intended to survey ordinarily the transition to the KS in schools (EC, 2006b). This report was based on OECD and UNESCO recommendations regarding the population to be surveyed and the methodology to be used in the survey, which was answered by teachers and the school administration.

As can be seen in Table 6.2., the above-mentioned survey included a total of three dimensions with a demand-side approach. Questions included the availability of equipment (computers and Internet access), the use of ITCs in the learning process

[42] See, for example, "Education and Training 2010", the "eLearning" initiative and the "Action Plan."

and the assessment of teachers and authorities regarding the skills, impact and barriers to their use.

Table 6.2.: ICT Survey in Schools (Eurostat)

Model Form		
Survey / Respondent	Survey items / questions	Survey information
Teachers	Personal computers	Access, applications, % of use in class, type of material used (in digital format), skills, reasons for not using them.
	Perception	Barriers to their use in class, students' attitudes towards computers, school infrastructure
	Reference indicators	Subject, years of experience
School	Infrastructure	Computers available for instruction per locality, computers with Internet access, type of connection.
	Applications	Web page, webmail service, LAN, Intranet.
	Perception	Impact of use of computers in class, of ICT training and of ICT use by students with special needs.
	Reference indicators	Enrolment, educational level, locality.

Source: EC (2006b)

Based on these advances in the measurement, the 2007 report of the i2010 action plan included a basic set of core indicators intended to monitor the objectives regarding connectivity and ICT training (Table 6.3.). These indicators, though arising from the same survey used in the specific report, constitute a first attempt at creating a set of statistics that allow monitoring the progress of these institutions, despite which ICT indicators in schools were not included in the 2008 report. However, the measurement exercise was not done again, which casts doubts over the systematisation of the survey used.

Table 6.3.: Benchmarking Indicators (Eurostat)

Use and availability of ICTs in schools
Number of computers with Internet access every 100 students.
% of schools with broadband Internet access.
% of teachers who have used a computer in class in the last twelve months.

Source: Eurostat (2007)

This apparent lack of continuity of the exercise should not be assimilated into the lack of measurement of the phenomenon in the next years. What is emphasised here is the risk of adopting similar indicators on the grounds that they are comparable, without first understanding the reason why they were discontinued in the countries that created them.

In this regard, penetration rates in schools are likely to be such (in fact, in many countries they reach 100 percent) that indicators have become irrelevant and what is observed is the vacuum generated in the measurement between development and the implementation of new assessment methods. In this regard, the application of these indicators would be useful for Ibero-American countries to the extent that it would allow capturing the distance regarding connectivity. But, of course, only that. If it is assumed that connectivity is available in all institutions, then advances are to be expected in the measurement of skills, development of content and applications. In this case, basing the assessment of the gap on basic connectivity indicators can only lead to

misinterpretations of reality and to believe that we have bridged the gap when, as a matter of fact, what has actually occurred is that technological borders have moved.

c.3.UNITED NATIONS / ECLAC / OSILAC

The advances made by OSILAC in the measurement of ICTs in schools are as scarce as those made by OECD or Eurostat, if not scarcer. However, the role ICTs and learning processes play in Latin America is notably more strategic than that in e-Europe. The importance of connectivity in schools for the transition to the KS has been recognised since the 2003 Geneva Commitment reached at the World Summit on the Information Society.

This commitment, made in Geneva in 2003 and reaffirmed in Tunis in 2005, was revitalised among Latin American countries in 2008. During the second Ministerial Conference on Information Society in Latin America and the Caribbean held in February 2008, the San Salvador Commitment, which established education and ICTs as the first strategic objective of eLac 2010 (ECLAC 2008), was signed.

In this regard, though at present there are no indicators reached by consensus (in fact, only a few countries in the region have some sort of information on this). The commitments undertaken in San Salvador show the need to generate statistical information in the short-mid term if progress in the fulfilment of the objectives set forth is to be monitored.

As it results from Table 6.4., the indicators that should arise from the objectives set forth are similar to those that have been suggested and calculated by bodies such as OECD or Eurostat, but based on a different conception of the role ICTs play –or should play- in the learning process. Thus, though connectivity in most schools is included as an objective (or a significant increase in connectivity rates in those countries with lower relative development), the main concern focuses on the need to train teachers and students, turn ICTs into a tool to be used in the learning process and in the development of educational content.

Table 6.4.: San Salvador Commitment (eLAC 2010)

Chapter 1: Education	
Description of Measure	**Objectives**
Framework	Develop school curricula that cover data, information and knowledge management and that strengthen teamwork, learning capacity and problem-solving ability.
	Conduct annual studies on the impact of ICT use on the educational system, which, inter alia, address the following: the impact of Technologies on teaching-learning processes in public and private educational centres, the level of use of ICTs by teachers as a supplement in their classes and the state of development of educational software.
Access	Connect 70% of public educational institutions to the Internet, preferably via broadband connections, or **triple** the current number.
Capacities	Ensure that, by the time they complete school, **90%** of students have used computers for educational purposes for at least 100 hours or **double** the current number. Such use requires appropriate training according to the type and level of education and should contribute to students' job skills.
	Train **70%** of teachers in the use of ICTs or **triple** the current number.
	Train **70%** of teachers and civil servants in the education sector in the use of ICTs for the development of school curricula, or **triple** the current number.
Applications and content	Ensure that **all** national education portals meet the eligibility requirements for full membership in such portals' regional networks.
	Seek to establish a regional market for digital services and content, to include the implementation of forums, through a public-private partnership with commercial suppliers.
	Increase the exchange of experiences and high-quality content in regional networks of education portals, including Web 2.0 applications and other distribution channels such as television and radio.
	Disseminate experiences with the use of virtual reality tools as ICT applications in educational curricula designed to foster cultural diversity and tolerance and to combat discrimination on the basis of, inter alia, race, gender, religion, ethnic origin, illness and/or disability.

Now, despite this statement of purposes, the proposal regarding indicators that arises from the consensus reached in the Partnership context seems to reflect the actual measurement possibility rather than the need to monitor the objectives set forth. In fact, the indicators reached by consensus (Table 6.5.) arise from the proposal made by UNESCO Institute for Statistics (UIS) at the World Summit for Information Society in 2005 (Partnership, 2008)[43]. The advantage of these indicators lies in the fact that the information they require is already available, which prevents an overburden of activities for those who generate statistics. Thus, though their simplicity limits the complex analysis of the transition to the KS in schools, it would set the foundation for subsequent enhancements aimed at monitoring the objectives set forth at the San Salvador Commitment.

[43] Note that the at the Global Event on Measuring the Information Society, also organised by Partnership and held in 2008, the lists of indicators made by consensus, including those on the measurement of ICTs in schools, were discussed and updated. However, OSILAC's recommendations are still based on prior meetings, as by then the round of revisions and agreements for the new set had not concluded. The proposal is available at: http://new.unctad.org/templates/Event 888.aspx.

Table 6.5.: ICT Indicators in Education (Partnership / UNESCO)

ICT availability and use in schools
Basic core
% of schools with electricity
% of schools with a radio set used for educational purposes
% of schools with television set used for educational purposes
Student to computer ratio
% of schools with basic telecommunication infrastructure or telephone access
% of schools with an Internet connection
% of students who use the Internet at school
Extended core
% of students enrolled by gender at the tertiary level in an ICT-related field
% of ICT-qualified teachers in primary and secondary schools

Source: Partnership (2008)

Based on the proposed indicators, the implementation of the UIS proposed form in a selection of countries, and ECLAC Workshops on Indicators and specialised meetings, consensus has been reached on UNESCO proposals, in order to establish a minimum set of comparable indicators at a regional and international level.

Thus, in March 2008, at the Santo Domingo Conference on ICT Indicators in Education in Latin America and the Caribbean, a proposal was made regarding a series of areas to be covered that enlarged and combined the experiences and proposals of UNESCO, OECD and eLAC2010 goals, which were then turned into short- to mid-term objectives of the San Salvador Commitment, signed a few months earlier in San Salvador.

Similar conclusions were drawn at the IV Seminar held in September 2008. During this event, after the presentation of the progress made by UNESCO and the meta-analysis of the school survey, it was held that a pyramidal approach is required, with the base being formed by necessary national indicators, medium levels by regional indicators and the top by the minimum set of indicators to be agreed by developed and developing countries. Otherwise, there is the risk that the amount of information to be collected (a large number of common indicators, as is the case for other rows) could not coincide with the actual capacity or willingness of the country to measure the indicators.

d. Towards a Strategy for the Analysis of the Schools Sub-row in Ibero-America

The ideas and proposals expounded below arose from the discussions and contributions that took place at the IV Ibero-American Seminar on Knowledge Society Indicators held in Lisbon, on September 11-12, 2008, and, in particular, from the presentation made by Nuno de Almeida Alves and Roberto Carneiro.

One of the first issues to be borne in mind when designing an internationally comparable set of indicators that may also be useful at the national level is that the set should take into account the progress made by other institutions, especially by those that exert greater influence on the statistical systems of the region. Disregarding said advances leads not only to the duplication of efforts in terms of agreements but also to a halt in the learning process that results from the implementation and analysis of indicators.

Considering the foundations laid by OSILAC, UIS and OECD, and within the framework of the strategic programmes i2010 and eLAC, we observe a number of consolidated indicators that do not require further explanation, namely, infrastructure and access indicators (see Box 5).

Although the usefulness of these indicators is clear, and effective data collection a pressing need, recent breakthroughs and areas not covered by available indicators show that progress should be made in the search for answers to some key questions:

- Which are the technologies currently available to schools at all teaching levels?
- How is ICT infrastructure used by students, teachers and administrative staff?
- Is infrastructure concentrated in ICT laboratories or distributed throughout classrooms?
- How do ICTs relate to the different subjects?
- Which contents are taught?
- What is the impact of ICT use on learning and student outcomes?

Finding answers requires an analytical-methodological framework that can allow for the multiplicity of actors and dimensions involved in the process. In other words, defining proposed indicators requires a basic scheme including all the dimensions and actors involved in this process of relating ICTs to the world of education.

Consequently, and following Alves (2008), a practical approach to the relationship between schools and new information and communications technologies should measure:

a) The scope: characteristics of ICT penetration and use in institutions devoted to elementary and secondary education, according to their location (urban or rural) and size (number of students).

b) Actors: the three actors involved in the process are institutions, teachers and students.

Firstly, there is a certain scope to be covered by the measurements. In this regard, although the educational process may span a wide age-range, we recommend considering only the formal education period, that is to say, the one between the beginning of elementary (primary) school and the end of secondary school. Likewise, both public and private establishment are included, and it is deemed crucial for indicators to distinguish between rural and urban schools.

The main actors of surveys could include principals, head teachers or coordinators of educational institutions, provided they are best suited to explain issues pertaining to the school as a whole.

The second group of actors, teachers, is more related to indicators showing ICT competencies, ICT use in teaching activities and in classrooms and teachers' opinions regarding ICT use in education in general and in the specific educational institution where they work. Needless to say, we are aware that teachers’ opinions on the impact or significance of ICTs in the learning process could become a key input for the analysis of the phenomenon and the identification of obstacles.

The third group of actors, students, is required to answer questions on the use of computers at school and the use of ICT tools in their daily activities (at school or elsewhere). In this regard, we do not deem it wise to include a questionnaire to be completed with the student's family, not because of a lack of analytical usefulness but rather because of the practicability of the task (it is worth remembering that some countries in the region do not even conduct ICT household surveys). This is not say, of course, that some questions could be included to determine socio-cultural strata or

levels of income, which could be inferred from alternative measurements, such as parents' level of qualification, school location, or school ownership and management characteristics (public or private).

Based on these three actors, it would be possible to establish a set of indicators which, by combining the pyramidal structure with already disclosed or agreed indicators, would provide answers to the questions concerning ICT infrastructure, capacities, efforts and applications in educational institutions and learning processes.

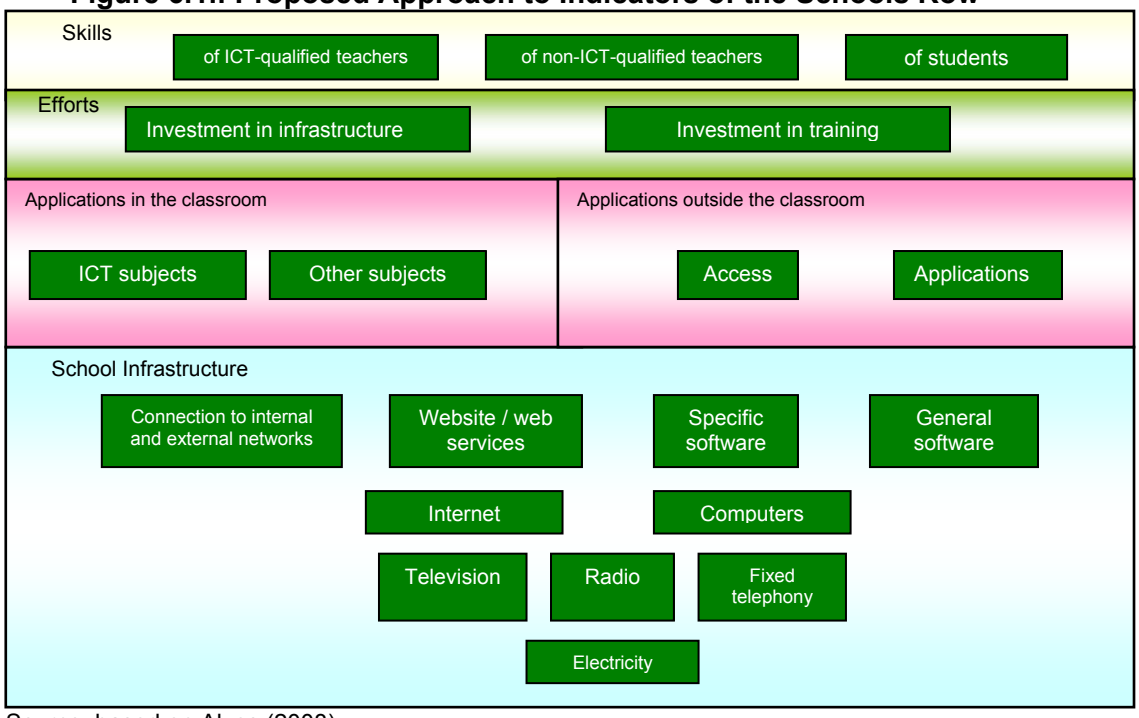
The proposed set of indicators is schematised in figure 6.1. As shown there, the dimensions of the matrix are combined in such a way that it is possible to obtain a comprehensive picture of the process of transition to the KS among schools.

An essential aspect of measuring the relationship between ICTs and education is, undoubtedly, the availability of infrastructure at educational institutions. Hence, it is important to collect data on the availability of computers, networks, Internet access services and software.

An additional aspect to be considered is the "IT density" of the use of ICT infrastructure, that is to say, the student to computer ratio, or the student to computer connected to Internet ratio. This indicator is important to account for the ease with which different actors handle technological resources. Another aspect to be borne in mind is the availability of broadband Internet access and of interconnections among computers and with other networks.

It may also prove useful to measure other issues related to computer and Internet use in educational processes and external communications. It would be highly important to measure the availability of institutional websites and the services and information they offer, as well as the availability of e-mail not only for administrative purposes but also for use by teachers and students (e-mail addresses and other uses, such as communication among actors within the educational environment).

Figure 6.1.: Proposed Approach to Indicators of the Schools Row



Source: based on Alves (2008).

As discussed above, the facilities where ICT tools are used, the frequency of use and the type of activities performed are essential aspects of the relationship between ICTs and education. Thus, it could prove useful to enquire teachers and students about Internet availability and use outside the educational institution, including directly about access and use at home.

With a view to compensating for the lack of computers and Internet access in a considerable proportion of households in countries with lower relative development, another contribution to the analysis would be determining whether the school is the only place where students can interact with ICTs, as well as where that interaction begins and who are the persons who assist students in the process of learning about these technologies.

The “skills” refers to the purposes pursued by each actor in their relationship with ICTs. In the case of teachers, indicators should account for their ICT competencies, both through the evidence offered by those in charge of the institution (existence of teachers with certified ICT competencies) and through subjective assessments (with the limitations these indicators usually have).

With respect to student competencies, the analysis should consider not only competencies acquired at different school levels but also knowledge obtained from other learning processes. This could include tasks students perform/know how to perform, which may not necessarily be related to pedagogical activities (chat, e-mail, games, downloading music or videos, etc.)

In relation to contents, a first measure would be to obtain data on the existence of websites (at a national and school level) and their applications. Secondly, the survey should include, as appropriate, questions on the availability of general and specific tools (software and multimedia according to discipline, student age, for teaching students with special needs, etc.) In this regard, both teachers and those responsible for the institution could account for the lack of use or inexistence of these tools, as the case may be, and describe their impact and significance if ICTs are available.

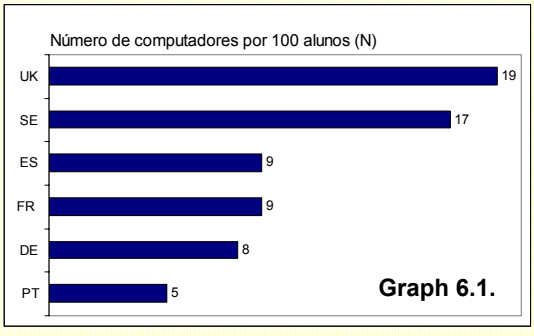
Another aspect to be surveyed, as is the case for other rows, is the flow of investment in infrastructure and competencies. Only if the computer/Internet access to student ratio is improved, if IT tools are enhanced and updated (specific software, applications and contents) and if teachers' competencies are built, will it be possible to add complexity to the use of ICTs, thus maximising their potential.

Finally, we could investigate interactions with the community. According to Alves (2008), the greater the tendency to use ICTs at community, business and government levels, the more ICTs will be used by teachers and students. Therefore, we propose two sets of indicators, one to be answered by the person in charge of the institution, with questions on ICT use at school to communicate with the community, and another set aimed at describing the community in which education institutions are immersed.

Box 5: ICT Use at Schools

Nuno de Almeida Alves*

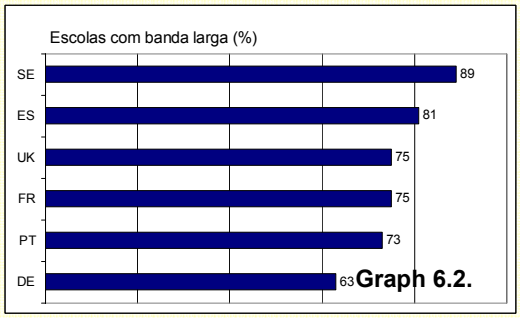
Despite being strategic for the development of the Knowledge Society and for redressing inequalities in the access to ICTs arising from social asymmetries, ICT use at schools has not been included in any systematic strategy developed by international statistical agencies to build an



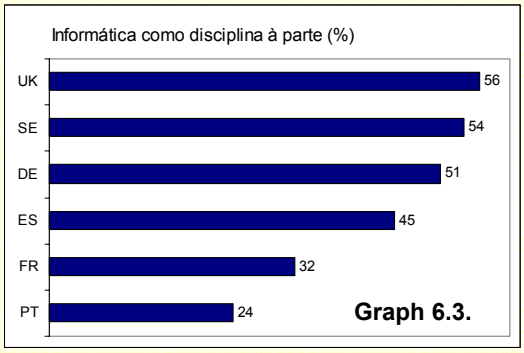
Graph 6.1.

observation programme. The information we are about to analyse illustrates this idea: it is a collection of data from a study called Benchmarking Access and Use of ICT in European Schools, commissioned by the European Commission, which surveyed 6 European countries with different degrees of economic development in relation to a fundamental set of indicators of ICT infrastructure and educational use in European schools.

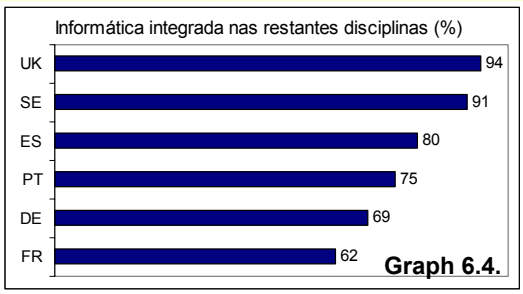
As regards infrastructure, there are large variations in the number of computers connected to the Internet per 100 students. Graph 6.2 shows data that reflect the existence of a dual situation in European countries: in Northern Europe the ratio is about 4 or 5 students per computer connected to the Internet, whereas in the remaining countries the ratio varies between 11 and 18 students, with Southern and Eastern Europe returning the lowest results. The European average ratio is 10 students per connected computer: should this figure be understood as a pattern in the field? Or does it depend on the size of schools in relation to the number of students of a specific model of articulation between ICTs and learning? The report provides no answer to these questions.



Graph 6.2.



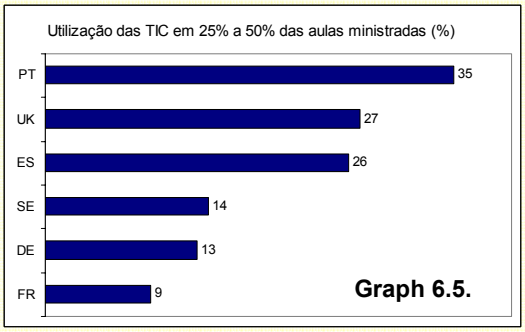
Graph 6.3.



Graph 6.4.

With respect to the available bandwidth, the study revealed more balanced results. In the selected countries, between 63% and 89% of schools have a broadband connection, and it is expected that, in time, all schools will be covered by this type of connection (Graph 6.2).

The transition from infrastructure-related aspects to computer and Internet use in teaching and learning processes in the classroom raises even bigger doubts. Two questions addressed at head teachers seem to be aimed at inventorying the way in which ICTs are implicated in the learning process: in the form of an autonomous IT subject (usually taught in IT labs) or, alternatively, as an integral part of teaching in most disciplines. The results obtained for the selected countries were not conclusive. In Portugal and Spain the answer seems to be “alternative strategies”, due to the relative complementarity observed; while in the United Kingdom and Sweden the answer seems to be “juxtaposed strategies” (Graphs 6.3. and 6.4.).



Graph 6.5.

The second part of this study seeks to provide some data on teacher competencies and practices in relation to ICT use. The selected indicator sheds light on the percentage of teachers who claim to use ICTs in the classroom, with said use ranging between 25% and 50% of all delivered classes (Graph 6.5). The presented data show that these tools are widely used (even more than expected) by the teachers of some of the selected countries. No information is provided, however, on whether teachers use ICTs as an expository and/or argumentative strategy or on whether or not ICT use is shared by students in individual and collaborative learning environments.

The data analysed show very clearly how little we know about ICT use in European schools and in other regions of the world, and so we underscore the need to build a system devoted to the systematic observation of ICT use in schools.

*Based on the document presented during the IV Seminar on Knowledge Society Indicators.

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Chapter 7: Community Access

Introduction

Moving into the Knowledge Society implies, as a fundamental premise, that all citizens have access to the basic tools of this new model of access to knowledge and information. It is within this context that, over the last few years, governments have looked for mechanisms to disseminate and facilitate access to ICTs, and that measuring them has become a key input for policy design and implementation.

Albeit in different backgrounds, both in developed and developing countries, access of all citizens to the "digital era" has been a source of concern and control. In the most developed countries, because this access means that their societies are progressing towards new forms of interaction, commercialization and production. In the least developed countries, because lack of access is an indicator of the scale of the digital divide. In Ibero-American countries, where both situations coexist –at a national and international level–, the problem of universal access has been addressed by adopting community connectivity policies with an emphasis on facilitating internet access through digital community centres.

During the IV Seminar there was a discussion over the implications of the lack of access and the need to advance a new measurement strategy to learn about the forms of access to this new society in the least favoured sectors. Thus, a proposal was made to incorporate a specific chapter on Public Access Centres into the Lisbon Manual. During the seminar, a proposal for the inclusion of the new sub-row "Community access and use" in the "Other institutions" row of the Manual was presented and discussed. The proposal considers key dimensions to be borne in mind when selecting, adapting and measuring access through community centres, both public and private.

That is, precisely, the objective of this chapter. The need to deepen our knowledge of ICT access points other than traditional ones (home, work, place of education) may help us become aware of the extent to which public intervention succeeds in overcoming lack of access –due to factors such as money, age, culture or literacy.

As is the case with the Schools sub-row, the fact that the topic has not been widely addressed in the discussions, meetings and workshops of the Network means that the analysis will not be as thorough in comparison to other chapters of this Manual. Of course, we expect this first analysis to be regarded as the starting point of a new debate forum on the wider issue of Universal Access to Information and Communication Technologies.

a. What is the Community Access Sub-row?

Citizens' access to ICTs has been a constant source of concern in private, political and academic spheres. As Internet use became widespread, the search for mechanisms to ensure universal connectivity was given priority in the development of public policies of the Knowledge Society. In this context, the most well-known policies –probably because they are also the oldest ones– were those meant to create places where both physical access to the Internet and the generation of user competencies would be ensured.

These places are usually referred to as Digital Community Centres (DCCs) and are "*institutional public or private spaces, labour unions, organizations of the civil society, or any combination thereof, focused on reducing the digital divide by ensuring the*

availability of collective access to information and communication technologies" (Porcaro and Barreto; 2008).

The objective of DCCs is to provide technological means to access the Internet to persons who do not have such access for economic reasons or for want of skills or telecommunications infrastructure. In some cases, these centres also offer training opportunities on the use of the Internet and other IT tools.

DCCs are different from Public Internet Access Centres (PIACs) in that the latter are places where the general public can have access to Internet services, regardless of the institutional belonging or purpose of the centre, while DCCs are a sub-category within PIACs and are characterised by their linkage to governmental measures aimed at promoting universal access.

Beginning with this classification, we can further differentiate each group depending on whether they are public or private, free of charge or not, specific or general. In any case, a DCC is any physical place that provides Internet access services, free of charge or at subsidised rates, and is run by public organisations, NGOs or other institutions (ITU, 2004).

b. Why Measure the "Community Access" Sub-row?

Universal Internet access is the basis of the process whereby the civil society moves into the digital era. Although Internet access does not guarantee new forms of communication, information, interaction, consumption or production, it is evident that if such a condition is not met, none of the actions above is possible.

Traditionally, this objective has been monitored by the so-called infrastructure indicators. Thus, it was assumed that the relationship between Internet users and the total population constituted a sufficient measure of how citizens were moving into the KS. Household surveys and the stagnation of the growth ratios of infrastructure indicators made it conspicuous that a percentage of the population was not being included in said measurement.

This reality is even more relevant for countries with lower relative development. While penetration rates in Europe are such that the traditional infrastructure indicator is no longer relevant, in many Ibero-American countries, most of the population cannot access the Internet, and this lack of access results from both lack of wiring and the fact that it is economically impossible to pay for connection costs. Digital Community Centres are thus the means through which the State contributes to achieving universal access.

The significance of community access indicators lies in the need to know the characteristics of the population that either has no access or that accesses the Internet through DCCs. If we accept that the percentage of population with Internet access (subscribers every 100 inhabitants) is a more or less clear indicator of the degree of connectivity, for countries making more or less systematic efforts to create DCCs, the percentage of persons who access the Internet through said DCCs should be added to the first percentage, thus obtaining the access rate.

Of course, knowing the characteristics of DCCs is also a key aspect when measuring the Knowledge Society, not only because action should be based on reality but also because we are dealing with public efforts that must be monitored, assessed and enhanced. In short, if this item is included in the budget, it is only expectable that there should be administrative records showing its situation and related policy outcomes.

When comparisons are made at the national level, community access indicators – together with other traditional connectivity indicators– are part of the information that is required to monitor the internal divide, to know the impact of access in isolated or less developed places and, most importantly, to assess the extent to which the State guarantees access. In other words, if Internet access is a necessary condition to move into the Knowledge Society, then said access becomes a right of the citizens of the digital era.

In any case, information is needed to quantify policy beneficiaries, the characteristics of access (for example, whether or not training services are provided, the connection is a broadband one and users can adequately surf the web or have to share computers, etc.), the degree of impact and, above all, the scope of the policy. It is futile to count DCCs if nothing is known about their impact in the surrounding environment, the quality of the service, the availability of human and material resources, and the extent to which DCCs interact with users' needs (a DCC with access to educational software is not the same as a DCC that only offers access to basic chat or e-mail activities).

In short, the usefulness of these indicators is similar to that of ICT indicators at the individual and family levels and is, in fact, a complement. The purpose is to know the extent to which the State contributes to bridge the gap and the way in which public policy translates into greater and enhanced progress towards the Knowledge Society.

c. How to Measure the "Community Access" Sub-row?

Unlike what happens with indicators discussed in previous chapters, measuring community access not only has a short history but has also been scarcely included in debates, strategic plans and attempts to establish minimum sets of comparable indicators. This is so mainly because we are dealing with a phenomenon that characterises nations with lower relative development and, as discussed in previous chapters, with shorter track records in building and systematising indicators.

Although at first sight establishing a minimum set of comparable indicators –including inventory indicators– may seem an easy task, on making a deeper analysis of the sources from which information can be obtained, measurement becomes more complex.

The first problem that arises when attempting to establish comparable indicators derives from the different institutional denominations and forms under which DCCs can be organised. Although all DCCs are essentially public access places at a low cost, they may be managed or financed by governmental institutions; free of charge or not, and in the latter case, rates may be calculated on a market-value or subsidy basis; they may be institutions devoted exclusively to ICTs or form part of larger facilities (libraries or neighbourhood centres); their activities may be focused on the availability of computers only or may also include training courses; etc. In short, even though all countries could identify community access policies within their general policy scheme, counting access centres is not an easy task.

The second problem has to do with identifying a target population. In general, people who have no access at their home, work or place of education are identified by ICT household surveys. As noted above, these surveys are not widespread in the region, and surveys that are indeed conducted do not always enquire about individuals but simply about the household. Likewise, household surveys tend to focus only on urban population, while an important aspect of community access involves seeking connectivity for those who live far from big cities.

The third problem refers to the operational complication that arises from the homogenisation of information sources. When the quantification and characterisation of centres is based on national administrative sources, the particularities of each administration become methodological incompatibilities upon trying to homogenise indicators. The problem is worsened when universal connectivity programmes originate in provinces or states and there is no homogenisation at the national level. Following Porcaro and Barreto (2008), "*the public/governmental and private/commercial simplifications also present difficulties. Many DCCs are funded by mixed sources: commercial, franchise, non-governmental organizations, universities, schools, different levels of government, multipurpose enterprises*". The specific form adopted by each programme in terms of the allocation of funds will originate different DCCs, and their identification and aggregation will require more information than a mere quantification of physical infrastructure.

Nevertheless, despite these difficulties, the measurement of community access has not been fully disregarded, and, with the aforementioned limitations, several bodies have engaged in the generation of comparable indicators capable of showing the characteristics of community access.

Again, as summarised by Porcaro and Barreto (2008), *"DCC statistics and indicators are related to the viewpoints of supply and demand, with the first measuring access establishments/centres, types of centres, their infrastructure and geographical distribution and the second quantifying individuals who access the Internet from community or commercial access centres".* Below we discuss the indicators agreed by the organisations analysed in this Manual.

c.1. OECD

For OECD, the measurement of universal access is included within the general recommendations of measurement of ICT use by households and individuals, which only denotes how little attention is paid to these issues. In the proposed questionnaire of ICT access and use by individuals, a recommendation is made to enquire persons who have no home access about any out-of-home access. Disaggregated categories presented in the model form include access through Community Internet Access Facilities and it is noted that this category should bear the specific name given to these places in each country (Table 7.1.).

Table 7.1.: Question on Internet Access Places (OECD)

At which of these other places did you use the Internet in the last 12 months?*	
Multiple responses allowed	
Work (other than home)	
Place of education	
At another person's house	
*Community Internet access facility***	
Commercial Internet access facility	
Other places (please specify)……..	

* Population: all in-scope individuals who used the Internet at places other than at home, using a fixed access device, in the last 12 months. ** Each country should tailor the response categories for the facilities available in their country.
Source: OECD (2007)

Outside the category included in the question on access places, the Guide only refers to the issue of community access in the annex for developing countries (OECD, 2007).

Here, OECD follows the recommendations of the Partnership on Measuring ICT for Development and works on data collection of the International Telecommunication Union (ITU). As explained in the Guide, for developing countries, Internet access through community centres is an important element of national strategies. Hence, we suggest estimating the number of localities, towns or cities of each country with public internet access centres (PIACs), and to include them as a category in the question on access places of household surveys.

This PIAC infrastructure indicator, collected and distributed by ITU, would supplement the demand approach of the surveys with the supply approach found in administrative records.

Although not included in the Guide, ITU's work on information on community access extends beyond the number of localities with PIACs. As shown in table 7.2., the set of indicators proposed by ITU also includes the distinction between PIACs and DCCs and the potential and real public who make use of these centres. The first agreements on this set of indicators were reached in 2004, in the Regional Indicators Workshop on Community Access to ICTs, and became consolidated with the agreements made at the Fifth World Telecommunication/ICT Indicators Meeting, held in Geneva in 2006 (ITU, 2007). Table 7.2 contains a summary of indicators and their definitions.

Although information for these indicators seems easy to collect (because it is obtained from national administrative records), compilation tasks are made difficult by differing definitions, inconsistent classification criteria of centres and localities and the dispersion of records. Indeed, only a few countries have informed ITU about the availability and use of PIACs or DCCs (Porcaro and Barreto, 2008).

Again, according to the authors, classification problems are related to the lack of a single criterion in the definition of PIACs and DCCs, as well as in the political-administrative organisation of each country. For example, in Brazil, DCCs are called Community Telecentres and government levels include states and municipalities. In Chile, they are called Infocentres and the country is divided into regions and communes. In Colombia, they are called the same as in Brazil (Telecentres), but the country is divided into departments. To these differences we should add those public internet access facilities where it is also possible to carry out other activities (such as libraries or universities). In this case, although there may be no public community connectivity policy in place (and therefore, no administrative records), it is evident that such places also make it possible to achieve the objective of community access. Thus, the homogenisation of centres and divisions is a complex and hardly practicable task without prior agreements. Likewise, demand-based indicators (target population), would require ICT household surveys covering individuals, but not all countries in the region conduct them.

Table 7.2.: Community Access Indicators (ITU)

Indicator	Definition
Total number of Public Internet Access Centers (PIAC)	The total number of public Internet access centres (PIACs). A PIAC is a site, location, or centre of instruction at which Internet access is made available to the public, on a full-time or part-time basis. This may include telecentres, digital community centres, Internet cafés, libraries, education centres and other similar establishments, whenever they offer Internet access to the general public. All such centres should have at least one public computer for Internet access.
Total number of digital community centres (DCC)	The total number of a nation's digital community centres (DCC). A DCC is a place where the public can access Internet services from terminal facilities placed at their disposal. A DCC is an undertaking based on a government framework for universal access. It should offer equitable, universal and affordable access. A DCC is a sub-category of a PIAC but there are some minimum requirements for a Public Internet Access Centre (PIAC) to be considered a DCC. Every DCC should have at least one computer and one printer and a minimum connection speed of 64 kbit/s per centre to the Internet service provider (ISP). DCC users should also be provided with support and maintenance and it should be opened a minimum of 20 hours per week.

Total number of other public Internet access centres (PIAC)	The total number of other public Internet access centres (other than PIACs and DCCs). Other PIACs include cybercafés. Education Centres may be classified as a DCC or a PIAC, depending on the conditions they satisfy.
Number of localities with public Internet access centres (PIAC)	The localities (a nation's villages, towns and cities) that have at least one PIAC. A PIAC is a site, location or centre of instruction at which Internet access is made available to the public, on a full-time or part-time basis.
Percentage of localities with public Internet access centres (PIAC)	A public Internet access centre (PIAC) is a site, location, centre of instruction at which Internet access is made available to the public, on a full-time or part-time basis. This may include telecentres, digital community centres, Internet cafés, libraries, education centres and other similar establishments, whenever they offer Internet access to the general public. All such centres should have at least one public computer for Internet access. Localities refer to a country's villages, towns and cities. The percentage of localities with public Internet access centres (PIACs) is computed by dividing the number of localities with at least one PIAC by the total number of the country's localities and multiplying by 100. The indicator should be broken down by range (number) of inhabitants. This indicators will be used to measure the WSIS target "*to connect villages with ICTs and establish community access points*" by 2015.
Percentage of the population with access to a public Internet access centre (PIAC)	Measures the number of inhabitants enjoying PIAC coverage as a proportion of the country's total population. When a locality (village, town, city, etc.) has at least one PIAC, then the entire population living in this locality is considered to be served by that PIAC.
Target population for digital community centres (DCC) services	The potential population (anyone of age 6 or more) minus the number of non-community Internet users (those citizens that have Internet access from a point different from a PIAC, for example from at home).
Total number of computers in Digital Community Centres (DCC)	Refers to the total number of computers available in all Digital Community Centres. A DCC is a place where the public can access Internet services from terminal facilities placed at their disposal.
Actual digital community centre (DCC) usage percentage	To calculate the actual DCC usage percentage, countries should divide the actual number of DCC users by the DCC target population for DCC services and multiply by 100. A user is defined as a person who accesses the Internet at least once a month.

Source: ITU (2007)

c.2. EUROPEAN UNION / EUROSTAT

The European Union considers that universal connectivity is a necessary condition in order to accomplish the objectives of the Lisbon Strategy and the i2010 goals. However, access through community centres is not the means through which such goal is supposed to be achieved. On the contrary, the measurement of penetration is based on the quantification of households with Internet access and the development of broadband infrastructure. Indeed, the challenge of Internet access lies in securing access to broadband services and to 3G technology (EC, 2008a).

That is the reason why, in the question on access places included in ICT household surveys, the disaggregation of "other places" is recommended only as an option. As shown in table 7.3, the classification of public access places is not the one agreed by Partnership, ITU or OECD. Rather, a distinction is made between free or paid access places.

Table 7.3.: Question on Internet Access Places (OECD)

Where did you use Internet in the last 3 months (using a computer or other means)?	
Multiple responses allowed	
Home……..	
Work (other than home)……..	
Place of Education……..	
At another person's home……..	
Other places……..	
of the following ***(optional)***	
Public Library……..	
Post Office……..	
Public office, Municipality, Government Agency……..	
Voluntary or community access facility……..	
Internet café……..	
Commercial Internet access facility……..	
Hotspot (at hotels, airports, public places, etc.)……..	

Source: EC (2008b)

Of course, since this type of access is not considered an issue in e-Europe plans, neither benchmarking indicators have been established nor specific studies have been undertaken. In the European Union, the current idea of community access is related to the availability of hotspots (wi-fi spots) or public areas with free wireless access (cafés, airports, etc.).

c.3. UNITED NATIONS / ECLAC / OSILAC

Unlike the European Union or OECD recommendations, OSILAC has proposed measuring individual access to the KS from different angles, including access through Digital Community Centres. In fact, ever since the first agreements were reached on the Strategy for the Information Society in Latin America and the Caribbean (eLAC), it has been held that the creation of DCCs is a key element to achieve universal access. Among eLAC 2007 goals, we find the need to lower the user/PIAC ratio both by reducing potential users (greater individual connectivity) and by fostering DCCs based on community initiatives. Also, these centres should not only consider equipment availability, but also bear in mind that it is essential for users to have access to ICT training and information services (Maeso and Hilbert, 2006).

As regards measurement, a proposal has been made: *"to support and foster, with technical cooperation programmes, institution-building and methodological strengthening and the development of ICT access and usage indicators, differentiated by gender and social group and in accordance with the ITU definitions of community access indicators and the recommendations of the World Summit side event on monitoring the information society, taking into account their ongoing evolution and incorporating them into questionnaires and statistical instruments suited to the regional reality"* (ECLAC, 2005). That is to say, proposed indicators are the same as the ones agreed within the framework of Partnership-related activities and compiled and disseminated by ITU (see section 7.c.1).

At the same time, given the importance of these centres to secure access in Ibero-America, in 2006 a comparative study on a group of 13 countries of the region collected information from primary sources (those responsible for community access programmes) and from administrative sources (programme documents and information on public and private initiatives). As shown in table 7.4, this study made it possible to learn about the history and current situation of Public ICT Access Centres (PIACs) in general and DCCs in particular, with data on quantities, target population, infrastructure, associated services, budget, funding sources and scope. Likewise, this study paved the way for the homogenisation of categories and definitions concerning national mechanisms for the promotion of community access (Maeso and Hilbert, 2006).

Table 7.4.: Model Form for Community Access Programme Managers (OSILAC)

Survey for PIAC programme managers	
About the managing institution	Data about the institution (location, number of years in business)
	Classification of the institution (national, provincial, municipal)
About the PIAC programme	Characteristics of the programme
	Participation of other institutions
	PIAC programme scheme
	Government support scheme
	Scope of the programme
	Offered services and technologies
	Actual and potential users
About the implementation	Quantity, location and date of creation of PIACs (active and closed)
	Problems encountered

Source: Maeso and Hilbert, (2006)

In the San Salvador Commitment, which presents the eLAC2010 action plan, universal access is described as the second priority, and in order to achieve it, the document establishes the need to increase the coverage of ICT service networks, homogenise connection protocols and cut access costs. Likewise, the Commitment highlights the importance of connecting traditional public facilities such as libraries and places of education to digital networks and the promotion of public community access initiatives (ECLAC, 2008).

As regards indicators, progress and consensus have resulted in a set of community access indicators which combine a supply-based approach with a demand-based one.

In the agreed 2005 set of indicators (OSILAC, 2005), the question on Internet access through community centres is included within the basic set (and, as in OECD and Eurostat surveys, as an option among access places), and infrastructure indicators are aimed at measuring the number of localities with PIACs, differentiating rural from urban areas. These indicators supplement those collected by ITU, thus providing an outline of these institutions and their impact.

Although the San Salvador Commitment does not present a new list of indicators, agreed goals make it possible to establish a series of necessary measurements to monitor eLAC2010. Said goals consist in raising the number of PIACs and the size of communication infrastructure (to reduce the number of potential users per centre), connecting community facilities to the Internet and enhancing the design, functionality and purpose of universal ICT access funds (ECLAC, 2008). Both demand-based indicators and those arising from the San Salvador Commitment are summarised in table 7.5.

Table 7.5.: Community Access Indicators (OSILAC)

Community Access	
Household surveys	Place/s of individual Internet use in the last 12 months Possible responses: • Home • Work • Place of Education • At another person's home • Free Public Internet Access Centre (specific denominations to vary according to national practices) • Commercial Public Internet Access Centre (specific denominations to vary according to national practices) • Other places
Infrastructure and access	Percentage of localities with Public Internet Access Centres (PIACs) by number of inhabitants (rural/urban).
San Salvador Commitment: Infrastructure and Access	Strengthen and support the development of community-based network initiatives such as, for example, communication centres, training centres, telecentres, and community-based radio and television stations, to include the use of traditional and new technologies while respecting prevailing legal frameworks.
	Increase the number of ICT access centres serving the community, including libraries and other facilities, in order to halve the average ratio of potential users per centre, or achieve a ratio of 1,750 people per centre, regardless of whether it is public or private.
	Review the functionality, design and purpose of universal ICT access funds, and execute at least 80% of those funds.
	Identify and support projects that have produced good results, index existing regional portals and exchange experiences regarding community Internet access centres with a view to increasing their effectiveness and improving their sustainability, while also considering exchanges with other regions of the world.

Source: OSILAC (2005) and ECLAC (2008).

In short, unlike what happens in the European Union, in Latin America Internet access through community facilities is a major element of national strategies, particularly because it enables a large part of the region to overcome economic and capacity-related setbacks. The phenomenon of public centres (whether public or private) has characterised the region from the onset of the ICT revolution. Thus, making comparisons at the regional level is the means to determine relative positions, learn from good practices and heighten the degree of popular access to the KS.

d. Towards a Strategy for the Analysis of the Community Access Sub-row in Ibero-America

The analysis and indicators proposed below arose from the presentation made by Porcaro and Barreto (2008) during the IV Seminar, and from the discussions and agreements that took place in said seminar. Just as in the case of the schools sub-row, this proposal is a first attempt to homogenise interpretations and to begin to understand different realities and it intends to lay the foundations for the discussion and exchange of experiences among the countries included in the network.

According to the aforementioned authors, any proposed analysis or indicators should consider the following:

a) The existence of updated information for a considerable number of countries, obtained from reliable sources –such as National Statistical Offices,

government agencies and international organizations-, and which is immediately –or almost immediately- available.

b) The experience of good practices –as in Mexico and Chile- where there is a centralised coordination of access programmes that simplifies the systematisation of information (see box 6).

c) The already agreed indicators.

This said, the proposal involves the analysis of 11 indicators, which, if analysed as a whole, make it possible to characterise the community access situation in the countries of the region. These indicators are schematised in table 7.5, which shows that the majority of them coincide with those previously agreed and those presented in the work of Maeso and Hilbert (2006). However, some indicators have been added, and we believe it may prove interesting to include them in future analyses, albeit with the required agreements and adjustments.

Table 7.5.: Community Access Indicators (OSILAC)

Community Access	
Infrastructure	% of the population who access the Internet through public access centres
	Target population of public access centres
	% of localities with PIACs and/or DCCs per locality, according to population size
	Number of PIACs and/or DCCs per locality, according to population size
	Number of commercial PIACs
	Number of computers per PIAC and/or DCC
	Average number of computers per PIAC and/or DCC
	Predominant type of technology
Efforts	Number of DCCs created as a result of government programmes
	Allocated and executed government funds
Skills	Qualified staff
Applications	Offered services

Source: prepared on the basis of Porcaro and Barreto (2008).

These indicators may be grouped according to the different dimensions of the matrix. Infrastructure indicators include the so-called supply and demand-based indicators. Demand-based indicators measure the actual and potential public of public centres in general (PIACs) and DCCs in particular, provided this is possible (in some countries the distinction between PIACs and DCCs is not sufficiently clear). Supply indicators measure the number of localities with these centres, disaggregated by population size and number of DCCs, the number of computers per centre and the predominant type of technology (type of Internet connection, other ICTs). As regards private or commercial centres, we suggest collecting information on the basis of business information, although it would be difficult to determine the number of persons that have access to said centres. We also recommend analysing the commitment of the public sector through indicators that can measure the number of centres created as a result of government programmes and the proportion of government funds allocated to these programmes (executed funds), which will provide an outline of the efforts directed towards these institutions. Finally, we suggest a capacity indicator, with capacities being measured as a percentage of qualified staff and an application indicator based on the analysis of the types of services being offered.

As can be inferred from these indicators, although the measurement should optimally be based on DCCs and not PIACs (since commercial centres tend to take a business rather than a universal access approach), it is not always possible to distinguish them for statistical purposes, and hence, results should be examined in light of the type of centre being analysed (public or private, free of charge or not, community or commercial, etc.)

Thus, the analysis of this set of indicators would contribute to a better understanding of the phenomenon of DCCS, which would, in turn, lay the foundations for measuring their impact and the need for updating, expanding or restructuring these centres. Clearly, if technology advances and Internet household penetration increases, centres will have to adapt to the new demand schemes fostered by universal connectivity.

Box 6: A Look at the Availability of Indicators and their Sources

Rosa Maria Porcado*

The aim of this box is to analyse the indicators proposed above for the items infrastructure and efforts, in relation to the availability of information and the sources of said indicators, and to present the situation of three countries of the region regarding this issue: Mexico, Chile - mentioned as examples of good practices- and Brazil.

For the first indicator (demand-based): **% of the population who access the Internet through Public Access Centres**, information is obtained from the question "*Place of Internet Use in the last 12 months*" of household surveys. Hence, it is important to pay attention to the lack of standardisation/harmonisation of household surveys in the countries of the region, as well as to timing. Differences are found in the age as from which the question is made, the public access place and the reference period.

The second indicator (demand-based): **Target population of Public Access Centres** measures the number of persons who face a "technological deficit". The figure is calculated by subtracting the number of persons who are 6 years-old or over (potential population) from the number of persons who have non-community Internet access, that is, those have access from other places, such as home, work or place of education. Since the age for household surveys varies according to the country –the lower the age considered the greater the "technological deficit"- it is worth restating the need to standardise surveys, for example, 12 years-old or over.

Table 7.1.: summary of the availability of indicators - Mexico, Chile and Brazil

Indicators	Source	MEX	CHI	BRA
Infrastructure				
% of the population who access the Internet through public access centres	HS	X	X	X
Target population of public access centres	HS	X	X	X
% of localities with PIACs and/or DCCs per locality, according to population size	AR	X	X	X
Number of PIACs and/or DCCs per locality, according to population size	AR	X	X	X
Number of commercial PIACs	AR-BS	P	P	P
Number of computers per PIAC and/or DCC	AR	X	X	
Predominant type of technology	AR	P	P	P
Efforts				
Number of DCCs established as a result of government programmes	AR	X	X	X
Allocated and executed government funds	AR	X	X	X

References: HS - Official Household Statistics; BS - Official Business Statistics; AR – Administrative Record; P- Partial

The third indicator (demand-based): % of localities with PIACs/DCCs per locality, according to population size, depends on the existence of records of PIACs and DCCs, on the selection of localities and on the possible disaggregation of population. Only a few countries have records of PIACs and DCCs. However, many countries, within the framework of public digital inclusion policies, have information on existing DCCs and

those that are about to be established. It may be even more feasible for the region to totalise the number of DCCs established as a result of **government programmes,** one of the proposed effort indicators.

As regards the fourth indicator (supply-based): **Number of PIACs/DCCs,** per locality, according to population size, several countries disclose the number of DCCs in their official government websites. Data are obtained from government administrative records and/or from DCC records.

As regards the fifth indicator (supply-based): **Number of Commercial Internet Access Centres** (cyber cafés, Lan houses, Kiosks, etc.), information can be obtained from the records of these centres or from official business statistics. Certainly, this possibility will depend on the characteristics of the surveys conducted by each National Statistical Office, as, for example, whether or not the adopted classification of activities and/or business records allow the identification of these commercial internet access centres.

Indicators six and seven (supply-based): **Average number of computers per PIAC / DCC** and **Predominant type of technology** depend on the existence of records of surveys for this variable.

The remaining effort indicator: **Allocated and executed government funds** is related to the investments made and/or expenses incurred by governments for establishing and supporting DCCs aimed at bridging the digital gap. An important piece of information in this context is the use of the Fund for the Universalisation of Communications, especially in relation to the use of programmes for the universalisation of ICT access. This information is generally available at official government websites.

* Based on the document prepared by Porcado and Barreto (2008) and presented during the IV Seminar on Knowledge Society Indicators.

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