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ANALYSIS OF METHODOLOGICAL ISSUES AND NEW ICT INDICATORS FOR LATIN AMERICA AND THE CARIBBEAN*

Methodological and harmonization issues in household and business surveys on ICT
and recommendations for developing ICT in education indicators

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INTRODUCTION

This document is the result of the activities of the group of experts formed during the fifth Workshop on Information Society Measurement in Latin America and the Caribbean, Rio de Janeiro, 6-8 April 2009, organized by OSILAC.

Composed of one representative from each of the four SCA-ECLAC and OSILAC subgroups of experts on ICT statistics (households subgroup: Mexico; businesses subgroup: Argentina; e-government subgroup: Colombia; education subgroup: Dominican Republic), the group of experts held a working meeting at ECLAC headquarters in Santiago, Chile, on 11-12 May 2009.

The meeting reviewed methodological and harmonization issues that were raised during the revision of the Compendium of practices on the implementation of ICT questions in household and business surveys. In addition, it discussed a proposal to develop indicators for the eLAC goals, particularly those related to education and e-government.

The members of the group of experts then developed a technical file for each of the ICT indicators proposed by the Partnership on Measuring ICT for Development. These files document the formulation, calculation and main characteristics of each indicator, which together constitute an important input for continuing the ICT harmonized measurement process under way in the national statistics offices of the region's countries.

Lastly, those responsible for each of the topics of discussion prepared an assessment with observations and recommendations, which appear in this report. After review by the participants at the fifth workshop, the document will be presented at the fifth Meeting of the Statistical Conference of the Americas of the Economic Commission for Latin America and the Caribbean, to be held in Bogotá on 10-13 August 2009, as a result of progress made by the ICT working groups of the Statistical Conference and OSILAC.

Sections I and II of this document review issues related to methodology and the harmonization of ICT information in household and business surveys, respectively. The discussion on household and business indicators was launched at the first meeting of OSILAC, in November 2004, which produced a list of core ICT indicators of the Partnership on Measuring ICT for Development, endorsed by the United Nations Statistical Commission at its thirty-eight session in February 2007. A revised and expanded list was presented in February 2009 to the fortieth session of the United Nations Statistical Conference.

Section III reviews the proposed ICT in education indicators and the methodological recommendations for the harmonization of information, based on a list of core indicators proposed by the United Nations Educational, Scientific and Cultural Organization (UNESCO), headed by the education indicator designated by the Partnership. The review contains the proposals made in the region during meetings held by OSILAC and Red Latinoamericana de Portales Educativos [Latin American Network of Educational Portals] (RELPE) with education specialists and experts from the region's national statistics offices.

The section reviewing the list of ICT in e-government indicators proposed by the Partnership's working group on e-government and developed by the Economic Commission for Africa, as well as the recommendations on methodology and harmonization of information, will be presented at a later date as these items are still under discussion.

I. REVIEW OF ISSUES RELATED TO METHODOLOGY AND HARMONIZATION OF ICT INFORMATION IN HOUSEHOLD SURVEYS

A. CORE INDICATORS

The working framework put forth by the national statistics offices for measuring ICT in households and businesses consists of a list of core ICT indicators that the Partnership on Measuring ICT for Development first presented in February 2005 within the framework of the World Summit on the Information Society, held in Geneva (Switzerland). In February 2007, the list was endorsed by the thirty-eighth session of the United Nations Statistical Conference.

In February 2009, during the fortieth session of the United Nations Statistical Conference, the Partnership presented a report with a revised and expanded list of core ICT indicators, shown in table 1.

Table 1
REVISED LIST OF CORE INDICATORS ON ACCESS TO, AND USE OF, ICT BY HOUSEHOLDS AND INDIVIDUALS

Core indicators
HH1 Proportion of households with a radio
HH2 Proportion of households with a TV
HH3 Proportion of households with telephone
Fixed telephone only
Mobile cellular telephone only
Fixed and mobile cellular telephone
HH4 Proportion of households with a computer
HH5 Proportion of individuals who used a computer (from any location) in the last 12 months
HH6 Proportion of households with Internet access at home
HH7 Proportion of individuals who used the Internet (from any location) in the last 12 months
HH8 Location of individual use of the Internet in the last 12 months:
Home
Work
Place of education
Another person's home
Community Internet access facility
Commercial Internet access facility
Any place via a mobile cellular telephone
Any place via other mobile access devices
HH9 Internet activities undertaken by individuals in the last 12 months (from any location)
Getting information about goods or services
Getting information related to health or health services
Getting information from general government organizations
Sending or receiving e-mail
Telephoning over the Internet/VoIP
Posting information or instant messaging
Purchasing or ordering goods or services
Internet banking

Table 1 (concluded)

Core indicators
Education or learning activities
Playing or downloading video games or computer games
Downloading movies, images, music, watching TV or video, or listening to radio or music
Downloading software
Reading or downloading on-line newspapers or magazines, electronic books
HH10 Proportion of individuals with use of a mobile cellular telephone
HH11 Proportion of households with access to the Internet by type of access
Narrowband
Fixed broadband
Mobile broadband
HH12 Frequency of individual use of the Internet in the last 12 months (from any location)
At least once a day
At least once a week but not every day
Less than once a week
Reference indicator
HHR1 Proportion of households with electricity

Source: Partnership on Measuring ICT for Development, *Revisions and Additions to the Core List of ICT Indicators* [online] http://unstats.un.org/unsd/statcom/doc09/BG-ICTIndicators.pdf, 2009.

Noteworthy among the changes to the 2005 list were the following:

- The indicators for proportion of households with fixed telephone and proportion of households with mobile cellular telephone have been merged into a single indicator of households with telephone, which is broken down into three sub-indicators to distinguish between households with access to fixed telephone only, households with access to mobile cellular telephone only and households with access to fixed and mobile telephone.

- Emphasis has been placed on the recommendation to allow reporting of multiple locations of individual use of the Internet and multiple Internet activities by individuals.

- With respect to locations of Internet use, the categories "Any place via a mobile cellular telephone" and "Any place via other mobile access devices" were added, and although the countries can include the category "Other places," it is not recommended that this category be used in calculating the indicators.

- For Internet activities, the category "Getting information" (which included any type of information) has been eliminated, and instead it has been recommended that more specific and informative indicators on the progress of the information society should be calculated such as: "Getting information about goods and services," "Getting information related to health and health services" and "Getting information from general government organizations."

- In addition, the category "Leisure activities" (which included any type of leisure) has been eliminated from Internet activities, and instead it has been recommended that more specific and informative indicators on the progress of the information society should be calculated such as: "Playing or downloading video games or computer games," "Downloading movies,

images, music, watching TV or video, or listening to radio or music," "Downloading software" or "Reading or downloading on-line newspapers or magazines, electronic books."

- Moreover, separate indicators are recommended for the categories: "Sending or receiving e-mail," "Telephoning over the Internet/VoIP" and "Posting information or instant messaging."

B. RECOMMENDATIONS BY THE GROUP OF EXPERTS ON METHODOLOGY AND HARMONIZATION ISSUES

This section presents the principal agreements reached by the group of experts on issues related to methodology and harmonization of information on access to, and use of, ICT gathered through household surveys.

The inputs for discussion were: the International Telecommunication Union (ITU) *Manual for Measuring ICT Access and Use by Households and Individuals;* the OSILAC Compendium of practices on the implementation of ICT questions in household and business surveys; and the presentations and discussions from the Fifth Workshop on Information Society Measurement in Latin America and the Caribbean.

1. Reference period for questions on individual use of ICT in household surveys

A central topic of discussion by the group of experts was the reference period used in the questions on individual use of the Internet, which are included on the questionnaires for the household surveys conducted in the region's countries.

It is important for the reference period to be established in direct relation to the definition and measurement of Internet users because for the purposes of defining an Internet user, having used the Internet at some point in one's life is not the same thing as having used the Internet in the past year, in the past three months or in the past month, to give a few examples.

Table 2 lists the questions used in the household surveys most recently conducted by the region's countries.

Although the Partnership on Measuring ICT for Development has issued an international recommendation to set the reference period for questions on Internet use at 12 months, several countries in Latin America and the Caribbean have indicated that this period does not meet the information needs of national users of ICT indicators.

Table 2
**LATIN AMERICA AND THE CARIBBEAN: QUESTIONS ON INTERNET USE AND RESPONSE
CATEGORIES USED IN HOUSEHOLD SURVEYS**

Survey	Questions
Brazil, Brazilian Internet Steering Committee (CGI) – Survey on ICT, 2008	Have you ever used the Internet? When was the last time you used the Internet? (less than 3 months ago, between 3 months and 12 months ago, more than 12 months ago)
Colombia, Comprehensive Household Survey (GEIH), 2008	Have you used the Internet (in any place) in the past 12 months?
Costa Rica, Multiple Purpose Household Survey (EHPM), 2008	Has (name) used the Internet in the past three months?
Dominican Republic, National Multiple Purpose Household Survey (ENHOGAR), 2007	Have you used the Internet in the past 12 months, either at home, work or any other place?
Ecuador, Employment, Underemployment and Unemployment Survey (ENEMDU), 2008	Have you ever used the Internet, in any place?
Honduras, Permanent Multiple Purpose Household Survey (EPHPM), 2008	In the past 12 months, have you used the Internet? During the past three months, have you had Internet access?
Mexico, Survey on Availability and Use of Information Technologies in Households (ENDUTIH), 2008	Do you use Internet in this home or elsewhere?
Nicaragua, Household Survey to Measure Urban and Rural Employment, 2006	Have you used the Internet in the past six months, either at home, work or any other place?
Panama, Multiple Purpose Survey, 2008	Have you used the Internet in the past six months?
Peru, National Household Survey (ENAHO), 2008	In the past month, have you used the Internet?
Paraguay, Permanent Household Survey (EPH), 2008	In the past three months, have you used the Internet?
Uruguay, Continuous Household Survey (ECH), 2008	Have you used the Internet in the past six months?

Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of information provided by the countries.

Recommendation

The discussion underscored the importance of unambiguously defining what it is that the questions seek to measure and concluded that for the purposes of defining an Internet user, it is necessary to distinguish individuals who have the ability to use the Internet on their own without help from another person and have done so at some point in a reference period previous to the survey, e.g., 12 months, 3 months, 1 month.

The group then addressed the issue of the complementarity of the question on individual use of the Internet with the question on the frequency of individual use of the Internet, which was an extended core indicator in the 2005 list and is now a basic core indicator for measuring ICT.

The recommendation considers two cases:

- If the reference period that users of ICT information in the country require for evaluation coincides with the reference period that has been recommended for achieving international comparability, the recommendation is to identify Internet users through a single question on individual use of the Internet in the past 12 months.

- If the information needs at the country level call for a reference period for Internet use other than 12 months, the recommendation is to identify users through two questions: the first should determine whether the user is trained to use or has ever used the Internet; and the second should include different reference periods, with the condition that these periods should make it possible to identify individuals who have used the Internet in the past 12 months, to maintain international comparability.

Observation about time ranges: The response categories for the second question should be mutually exclusive. In other words, a user's response should correspond to a single response category, which should not be included in, or overlap with, another response category. (For example: (i) at least once in the past month; (ii) at least once in the past three months, but not in the past month; (iii) at least once in the past year, but not in the past three months.)

2. Survey respondents

It is important to have respondents who have all the necessary information on the individuals being surveyed in order to respond to the location and activity questions for individual use of the Internet.

As seen in table 3, there are different strategies for choosing respondents in household surveys in the region's countries. In some cases, the head of household is the respondent; in others, it is the best respondent on the topic; and in still others, the respondent is the same person whose individual use of ICT is being surveyed.

Table 3
LATIN AMERICA AND THE CARIBBEAN: RESPONDENTS FOR QUESTIONS ON ICT USE ON QUESTIONNAIRES IN HOUSEHOLD SURVEYS

Country, survey and year	Respondent
Brazil, National Household Survey (PNAD) – Brazilian Geographical and Statistical Institute (IBGE), 2005	A single respondent (the most qualified person in the opinion of the interviewer, subject to orientation).
Brazil, Brazilian Internet Steering Committee, (CGI) – Survey on ICT, 2005-2008	The person in the household who matches the preselected profile.
Chile, National Socio-economic Survey (CASEN), 2006	Head of household or his wife; if neither is present, a member of the household who is older than 18 years.
Colombia, Comprehensive Household Survey (GEIH), 2007-2008	Direct respondent for individuals 18 years or older and for 10- to 17-year olds who work or are looking for work. For other members, the person best able to respond is acceptable.

Table 3 (concluded)

Country, survey and year	Respondent
Costa Rica, Multiple Purpose Household Survey (EHPM), 2005 and 2008	Member of the household who is older than 15 years and has the information about the other members. Household members who are present at the time of the interview provide their own information.
Cuba, National Survey of Employment and Economic Conditions of Households (ENO), 2006 and 2007	In the 2006 survey, the respondent was the person present at the home who answered for all members of the household. The respondent indicated the number of people in the household only, and individual information was not recorded. In 2007, questions were answered individually by the people or by the respondent responsible for completing the survey.
Dominican Republic, National Multiple Purpose Household Survey (ENHOGAR), 2005 and 2007	A respondent is randomly selected from among the members of the household who are 12 years or older.
Ecuador, Living Standards Measurement Survey (ENCOVI), 2005-2006	Direct interview with each person in the household 12 years or older, or the most suitable individuals in the case of minors.
Ecuador, Employment, Underemployment and Unemployment Survey (ENEMDU), 2008	Direct interview with each person in the household 15 years or older, direct respondent; under 15 years, most suitable respondent. The ENEMDU begins collecting information on individuals at five years of age.
El Salvador, Multiple Purpose Household Survey (EHPM), 2005-2007	The head of household is the sole respondent.
Honduras, Permanent Multiple Purpose Household Survey (EPHPM), 2005-2008	The respondent is the person about whom questions are being asked; if absent, the most suitable respondent is sought, whether the head of household, the spouse, or a member of the household 15 years or older.
Mexico, Survey on Availability and Use of Information Technologies in Households (ENDUTIH), 2005-2008	A person older than 18 years of age who knows the information and whose birthday is closest to the date of the survey. If the selected respondent has no knowledge of ICT, assistance in responding can be sought from any other member of the household who is familiar with the requested information, preferably a user of ICT.
Nicaragua, Household Survey to Measure Urban and Rural Employment, 2006	Direct interviews with each member of the household 10 years or older. All regular residents of the household are surveyed.
Panama, Multiple Purpose Survey, 2006 and 2007	Every member of the household who is 10 years or older.
Paraguay, Permanent Household Survey, 2005-2008	Direct interviews with individuals 15 years or older. In the case of minors under 15 years, the head of household responds.
Peru, National Household Survey (ENAHO), 2007	Head of household, housewife, income generators, individuals 12 years or older.
Uruguay, Expanded National Household Survey (ENHA), 2006, and Continuous Household Survey (ECH), 2008	The individual in the household with the greatest knowledge of the other members is selected.

Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of information provided by the countries.

Recommendation

Ideally, the best method would be to obtain information directly from the person about whom the survey questions are being asked. However, selecting the most suitable respondent is the best alternative in cases in which the subject cannot be interviewed.

Some criteria that can be used to select the most suitable respondent are: the age of the respondent, his or her knowledge of the information and the possibility of enlisting other members of the household to help answer the questions.

In cases in which only one individual in the household is surveyed, the recommendation is to select that person randomly.

Moreover, when the respondent is directly interviewed, a key consideration should be the quantity and cost of the visits needed to obtain the information.

Lastly, consideration should be given to the time of the interview and the respondents who are available during the survey in order to prevent biased findings.

3. Response alternatives for questions on location of Internet use and Internet activities

The questions on location of individual use of the Internet and Internet activities by individuals offer some of the best opportunities for analysis and are among those of greatest interest to users of ICT information.

Identifying patterns and trends in location of Internet use and Internet activities is useful in analyzing the progress of the information society and in monitoring the digital divide between and within countries.

The questions used to inquire about Internet activities and locations of Internet use, as well as the countries' household survey questionnaires, are available in the OSILAC ICT Statistical Information System.[1]

Recommendation

An individual could use Internet in multiple locations and for multiple purposes. Accordingly, it is recommended that measurement of these categories should not be restricted to a maximum number of permitted options for each individual. Instead, the responses should be multiple selection, and the response categories should not be mutually exclusive.

The sum of the indicators for the various categories of location of Internet use could be greater than 100% inasmuch as each individual could indicate more than one location of use (or all the locations in the most extreme case). In the case of Internet activities, the sum of the indicators could also be greater than 100%.

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[1] See section on surveys [online] http://www.eclac.cl/tic/flash/default.asp?idioma=IN.

In its list of core indicators, the Partnership suggests a number of categories of analysis of locations of Internet use and Internet activities. However, countries may also consider the inclusion of other categories.

If a country wishes to establish a hierarchy of activities and locations of Internet use, it is suggested that additional questions should be added to those established in the activity and location of use indicators.

4. Imputation of missing data and handling of inconsistencies in responses

This issue was discussed at the fifth Workshop on Information Society Measurement in Latin America and the Caribbean. Incomplete information is a frequent problem. Missing information on one or more variables can result when a respondent does not respond or simply does not know the answer to a question.

Recommendation

Attention was drawn to the need to adequately define what is meant by imputation and what is meant by validation of inconsistencies.

As a first step in this discussion, a distinction should be made between non-response and underestimation of a variable.

Imputation means assigning values to a variable for which there is no information, and this imputed value is considered possible for the specific record. In this case, care should be taken to ensure that non-response levels are not high.

Validation means making changes to collected information based on the responses to related questions asked of the same subject.

The use of mobile data capture devices can help to automate controls to achieve consistency of data provided by respondents.

The general recommendation is to avoid imputation and if it is necessary, to document the process and ensure that a high percentage of collected data is not subject to imputation. In any event, the recommendation is to use consistency and field validation processes to the extent possible.

5. Use of administrative records to generate statistics

The possibility of using administrative records to generate ICT statistics and indicators is an item of interest not only in the case of households and individuals, but also in the case of businesses, especially in areas such as the use of ICT in education and e-government.

Household surveys, population censuses and administrative records are supplementary, not replacement, sources of information for measuring ICT.

Recommendation

If statistics are generated from administrative records, it is recommended that the quality of the existing data should be evaluated inasmuch as such data are not always collected for statistical purposes.

As an additional recommendation, good practices in collecting and using statistical information obtained from administrative records should be identified and documented. Accordingly, coordination between the producers of statistical information and the national statistics offices of each country is important to guarantee the quality, coverage and comparability of the information.

6. Type of survey

The type of survey in which to include questions on ICT access and use by households and individuals is an ongoing topic of discussion. Some countries have specialized ICT surveys while others incorporate these questions into multiple purpose surveys or surveys with broader objectives than the analysis of ICT access and use.

The following table summarizes the surveys according to their type and the way in which the questions are incorporated.

Table 4
**LATIN AMERICA AND THE CARIBBEAN: SURVEYS WITH INFORMATION
ON ICT ACCESS AND USE, 2008-2008** [a]

Country	Name of survey	Type of survey	Incorporation of questions	Years available
Antigua and Barbuda	National ICT Household Survey	Survey on ICT	Survey on ICT	2008
Brazil, Brazilian Geographical and Statistical Institute (IBGE)	Supplement on Internet access and possession of mobile cellular telephone for personal use, National Household Survey (PNAD)	Multiple purpose household survey	Section on ICT	2005 and 2008
Brazil, Brazilian Internet Steering Committee (CGI)	Survey on ICT use in Brazil	Survey on ICT	Survey on ICT	2005-2008
Cayman Islands	Survey of Living Conditions	Survey of living conditions	Questions on use in existing section	2007
Chile	National Socio-economic Survey (CASEN)	Survey of living conditions	Section on ICT	2000, 2003 and 2006
Colombia	Comprehensive Household Survey (GEIH)	Survey on employment	Module on use and penetration of ICT	First quarter of 2007 and third and fourth quarters of 2008
Costa Rica	Multiple Purpose Household Survey (EHPM)	Multiple purpose household survey	In 2005 and 2008, module on ICT. In 2006 and 2007, partial inclusion	2005-2008

Table 4 (concluded)

Country	Name of survey	Type of survey	Incorporation of questions	Years available
Cuba	National Survey of Employment and Economic Conditions of Households (ENO)	Survey on employment and living conditions	Module on ICT	2006 and 2007
Dominican Republic	National Multiple Purpose Household Survey (ENHOGAR)	Multiple purpose household survey	Section on ICT	2005 and 2007
Ecuador	Living Standards Measurement Survey (ENCOVI)	Survey of living conditions	Questions on use in existing section	2005 and 2006
Ecuador	Employment, Underemployment and Unemployment Survey (ENEMDU)	Survey on employment, underemployment and unemployment	Exclusive section for ICT and section on housing	2008
El Salvador	Multiple Purpose Household Survey (EHPM)	Multiple purpose household survey	Section on ICT	2005-2008
Honduras	Permanent Multiple Purpose Household Survey (EPHPM)	Multiple purpose household survey	Section on ICT	2004-2008
Mexico	Survey on Availability and Use of Information Technologies in Households (ENDUTIH)	Survey on ICT attached to survey on employment	Module annexed to an institutional survey already established in households	2001, 2002, 2004-2008
Nicaragua	Household Survey to Measure Urban and Rural Employment	Survey of employment	Section on ICT	2006
Panama	Multiple Purpose Survey	Multiple purpose household survey	Section on ICT	2006-2008
Paraguay	Permanent Household Survey	Survey of living conditions	Questions on use in existing section (household and population)	2005-2008
Peru	National Household Survey (ENAHO)	Survey of living conditions and poverty	Questions on use in existing section	2007 and 2008
Saint Lucia	Survey of Living Conditions and Household Budgets	Survey of living conditions	Questions on use in existing section	2005
Uruguay	Expanded National Household Survey (ENHA), 2006, and Continuous Household Survey (ECH), 2008	Multiple purpose household survey	Section on ICT	2006 and 2008

Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of information provided by the countries.

[a] Only surveys with at least one question on access to ICT and at least one question on use of ICT are included.

Recommendation

After analyzing the pros and cons of the different types of surveys, the freedom of each country to choose the best methodology for gathering information, basically according to their specific interests in this area, was reconsidered.

It was determined that specific surveys produce a detailed account of the uses and impacts of ICT at the individual and household level. However, they do not provide many opportunities for analysis against socioeconomic variables, and they can be more expensive, which jeopardizes their sustainability over time.

By contrast, multiple purpose surveys offer a greater variety and number of opportunities for analysis against other topics of interest to the countries but produce less detailed information on fewer variables.

Accordingly, when survey questions are being designed, it is important to ensure that the information gathered can be used both by researchers and by policymakers.

To the extent possible, countries that need detailed information on aspects such as ICT skills, e-commerce, e-government and e-health should conduct specific surveys on these topics.

In any case, it is suggested that consideration should be given to the sustainability of ICT information gathering tasks, and if resources for the regular collection of information on this topic are not available, the recommendation is to incorporate the questions into multipurpose surveys.

7. Complexity of the questions on connection type and speed

A discussion point that has been identified from the information gathered in household surveys is that respondents often do not know the type or speed of Internet connection in their homes. However, this is a matter of great interest because the possibilities of use differ according to whether the connection is broadband or narrowband, so it is important to conduct analyses to characterize this difference.

Recommendation

In the case of household surveys, the suggestion is to categorize responses by type of technology, without specifying speed, in order to identify the percentage of households with broadband, narrowband and mobile broadband connections. In this case, all connections would be considered broadband, with the exception of dial-up connections.

It is recommended that speed should be specified only if deemed necessary, which will be at the discretion of each producer of information. In terms of speed, connections faster than 256 Kbps are considered broadband.

It should be noted that most of the surveys are multiple purpose in nature, not specific to ICT, and the quality of the responses is related to the interviewee's familiarity with the topic.

II. REVIEW OF ISSUES RELATED TO METHODOLOGY AND HARMONIZATION OF ICT INFORMATION IN BUSINESS SURVEYS

A. CORE INDICATORS

Information and communication technologies (ICT) have become tools of efficiency, productivity, competitiveness and development for businesses, and the region's countries have come to recognize the importance of implementing them in the productive sector.

To evaluate the importance of ICT in the economies of Latin America, the Partnership on Measuring ICT for Development, in collaboration with the region's national statistics offices, compiled the first list of core indicators of use of ICT by businesses (Geneva, February 2005). This list has been the document of reference for national statistics offices in the region, which have incorporated ICT statistics in their research. A revised version was presented at the fortieth session of the United Nations Statistical Commission in February 2009.

The following table presents the summarized list of core indicators proposed for measuring ICT through business surveys.

Table 5
SUMMARIZED LIST OF CORE INDICATORS PROPOSED FOR MEASURING ICT THROUGH BUSINESS SURVEYS

Indicator	Description
B1	Proportion of businesses using computers
B2	Proportion of persons employed routinely using computers
B3	Proportion of businesses using the Internet
B4	Proportion of persons employed routinely using the Internet
B5	Proportion of businesses with a web presence
B6	Proportion of businesses with an intranet
B7	Proportion of businesses receiving orders over the Internet
B8	Proportion of businesses placing orders over the Internet
B9	Proportion of businesses using the Internet by type of access (narrowband, broadband (fixed, mobile))
B10	Proportion of businesses with a local area network (LAN)
B11	Proportion of businesses with an extranet
B12	Proportion of businesses using the Internet by type of activity: Sending or receiving e-mail Telephoning over the Internet/VoIP Posting information or instant messaging Getting information about goods or services Getting information from general government organizations Interacting with general government organizations Internet banking Accessing other financial services Providing customer services Delivering products on line Internal or external recruitment Staff training

Source: Partnership on Measuring ICT for Development, *Revisions and Additions to the Core List of ICT Indicators* [online] http://unstats.un.org/unsd/statcom/doc09/BG-ICTIndicators.pdf, 2009.

B. RECOMMENDATIONS ON METHODOLOGY AND HARMONIZATION ISSUES

Although there is general agreement on recognizing this list as the minimum core list of indicators for measuring use of ICT by businesses, not all countries have followed the same procedures for gathering the information needed to construct the indicators. The national statistics offices and OSILAC have detected some problems in obtaining such information.

These problems, the discussion points from the meeting of the group of experts and the recommendations on each point, adopted by consensus of the group of experts, are described in detail below.

1. Survey respondents

The national statistics offices of some countries in the region reported to OSILAC that they encountered certain problems in obtaining information on ICT in businesses because survey respondents did not always have the knowledge they needed to answer the questions.

In the case of business surveys, most national statistics offices recommend that the respondent should be from the ICT area. However, businesses make the final decision on who responds to surveys, and in some cases the respondent is a member of the accounting staff, instead of somebody knowledgeable about ICT use.

Recommendation

With respect to a suitable respondent for business surveys, the recommendation that emerged from the group of experts' discussion was that, where possible, the person responding to the ICT section of a survey should be somebody from the ICT area, even if accounting staff complete the rest of the survey. This recommendation should be issued directly by the national statistics office in the case of ICT modules in economic or innovation surveys.

2. Imputation of missing data and handling of inconsistencies in responses

There are cases in which the non-response rate for information on ICT use by businesses is high because a knowledgeable respondent did not answer the questions, as mentioned in the previous point. However, there are other factors that contribute to incomplete surveys and to address this problem, a decision should be made either to implement a statistical procedure that allows the missing data to be estimated (imputation) or to write off the information as lost.

Recommendation

In general, the recommendation is to avoid the imputation of missing data in business surveys. However, when the missing information corresponds to very large companies that can impact the sector's principal indicators, additional visits or calls should be made until the information is obtained. If the information cannot be obtained, the values should be imputed, which is a valid course of action under such circumstances. In any case, the recommendation is to use consistency and field validation processes.

The type of survey that is being conducted should also be taken into account. In the case of multiple purpose surveys with quantitative economic information, imputation is not advisable due to the specific characteristics of the process.

3. Use of administrative records to generate statistics

Censuses, administrative records and economic surveys are supplementary sources of information and there are advantages and disadvantages to each for measuring ICT. Therefore, the group of experts proposed the use of administrative records as an alternative for obtaining information.

Recommendation

In the case of business surveys, administrative records should supplement the information derived from the surveys. The national statistics offices should always be involved in the generation of indicators from administrative records in order to guarantee their quality, coverage and comparability.

4. Type of survey

The point of discussion was to determine what type of survey is the most effective and accurate for measuring use of ICT by businesses. As of May 2009, there were a large number of multipurpose (economic) surveys but also many ICT-specific surveys.

Table 6
**LATIN AMERICA AND THE CARIBBEAN: TYPE OF SURVEY USED TO COLLECT
CORE INDICATORS ON ICT IN BUSINESSES**

Country	Type of survey used to collect core ICT indicators
Argentina	Innovation survey
Brazil (IBGE [a])	ICT survey
Brazil (CGI [b])	ICT survey
Chile	Economic survey
	ICT survey
Colombia	Economic survey
Cuba	Economic census
	ICT survey
Dominican Republic	ICT survey
Mexico	Economic census
Panama	Economic survey
Peru	Economic census
Uruguay	Economic survey

Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of information provided by the countries.

[a] Brazilian Geographical and Statistical Institute.
[b] Brazilian Internet Steering Committee.

It is suggested that countries with the most advanced information societies and the greatest economic development should consider the possibility of using instruments specifically designed to measure ICT. The countries that are less advanced can use existing instruments.

Recommendation

` After analyzing the pros and cons of each type of survey, the freedom of each country to choose the best methodology for gathering information, according to their specific interests, was reconsidered.

It is recognized that the inclusion of an ICT module in economic surveys would provide greater stability to the section that gathers information on these technologies, given that its continuity would be guaranteed, and would enrich the analysis with the additional information that could be derived from the survey, such as cross-sectional comparisons with socioeconomic variables. Moreover, it would prevent the businesses, which must already respond to several surveys, from being overburdened.

By contrast, specific surveys would have the advantage of producing more detailed, better quality information, inasmuch as the respondents would generally be more knowledgeable about ICT-related information.

5. Complexity of questions on connection type and speed

Although these questions are more problematic in household surveys, the national statistics offices also identified some degree of incomprehension or lack of expertise regarding these types of questions among respondents to business surveys. The most important point is to identify the proportion of businesses that use narrowband, fixed broadband and mobile broadband connections.

Recommendation

As mentioned in the section on household surveys, the recommendation is to inquire about the type of connection but not necessarily the speed, although this decision is at the discretion of each country. In the case of businesses, questions about speed and technologies can be asked because ICT staff are expected to be more knowledgeable about such technologies.

However, in the case of microenterprises, the recommendation issued for household surveys can be followed. In other words, inquiries should be made about connection type only inasmuch as all connections, with the exception of dial-up, could be considered broadband. In terms of speed, connections faster than 256 Kbps are considered broadband.

6. Calculation of the number of people using computers or the Internet at businesses

The national statistics offices reported that businesses have a hard time calculating the proportion or exact number of people using computers or the Internet.

Recommendation

The recommendation to inquire about the proportion, not the exact number, of staff routinely using computers or the Internet continues to apply.

7. Sector classification

A review of Latin America and the Caribbean shows that different types of systems are being used to classify economic sectors.

Table 7
LATIN AMERICA AND THE CARIBBEAN: CLASSIFICATION OF ECONOMIC SECTOR IN BUSINESS SURVEYS

Country	Name of survey	Classification of economic sector
Argentina	National Survey on Innovation and Technology	National Classification of Economic Activities (CNAE), section D, adapted from the International Standard Industrial Classification of all Economic Activities (ISIC) Rev. 3
Brazil, Brazilian Internet Steering Committee (CGI)	Survey on Use of Information and Communication Technologies in Brazil and ICT in Microenterprises	CNAE, sections: D-F-G-H-I-K-O.
Chile	Annual Survey of Small and Medium-sized Enterprises Information and Communication Technologies in Microenterprises	ISIC Rev. 3, sections: C-D-E-F-G (50, 51, 52)-H-I.
Colombia	Annual Manufacturing Survey	ISIC Rev. 3, section D.
	Annual Services Survey	ISIC Rev. 3, sections: H-I (63, 64)- K-O (92, 93).
	Annual Commerce Survey	ISIC Rev. 3, section G.
	Survey of Microenterprises in Commerce, Services and Industry	ISIC Rev. 3, sections: D-G-O.
Cuba	Specialized ICT Survey	ISIC Rev. 3, ICT foreign trade sector.
Mexico	Economic Census for the Manufacturing Industry	North American Industry Classification System (NAICS), sectors: 31-33, adapted to Mexico.
Panama	Survey of Non-financial Businesses	National Standard Industrial Classification (CINU)
Peru	IV National Economic Survey	ISIC Rev. 4, except for agricultural, financial and public sector activities.
Uruguay	Economic Survey	ISIC Rev. 3, sections: C-D-E-F-G-H-I-K-M-N.

Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of information provided by the countries.

Recommendation

As this is a general matter, it is recommended that the countries should create synergies in the framework of the Statistical Conference of the Americas of ECLAC as they migrate to ISIC Rev. 4. Mexico would be the sole exception because it uses NAICS, which will only allow it to harmonize indicators at the uppermost level, that is, at the level of the major branches of economic activity.

III. REVIEW OF THE PROPOSED ICT IN EDUCATION INDICATORS

A. BACKGROUND

The Partnership on Measuring ICT for Development, established in 2004, formed a special group on measuring ICT in education, headed by UNESCO.

The initial set of proposed ICT in education indicators was presented by the UNESCO Institute for Statistics (UIS), based on a review of 10 surveys entirely or partially dedicated to measuring ICT infrastructure and use in educational systems.[2] UNESCO identified, compiled and systematized the main international education surveys that covered this topic, which laid the foundation for more rigorous research on this key issue for development processes in the twenty-first century. Based on the identification of the indicators most used in the various surveys, an initial list of indicators was proposed.

Subsequently, during the third workshop organized by OSILAC, the National Statistics Office of Cuba presented a proposal of indicators on ICT access and use for educational, health and sports institutions, as well as community Internet access facilities.

The fourth workshop organized by OSILAC, held in February 2008 in El Salvador, produced a proposal containing 20 indicators on infrastructure, use and skills, based on the indicators agreed on by UNESCO and the proposal made by the National Statistics Office of Cuba.

In August 2008, at the indicators workshop organized by OSILAC and RELPE in the framework of the seminar-workshop on editing in Latin American portals and for the definition of ICT in education indicators, held in Antigua (Guatemala), education experts proposed a series of indicators based on the 2008 UNESCO framework for developing ICT competency standards for teachers and the eLAC2010 goals. Many of the indicators are qualitative, so they are not included in this proposal.

Based on the aforementioned discussions in the region, indicators 3, 5, 6 and 7, on the proportion of schools with computers and computer labs and the proportion of schools with computers connected to local area networks (LAN) and wide area networks (WAN), have been added to the core indicators proposed by UNESCO upon the experts' determination that there is a need for information on these indicators in Latin America and the Caribbean.

The following proposal is based on all the aforementioned efforts. It also takes into consideration the achievements of the UNESCO Institute for Statistics, presented at the meeting of the Partnership on Measuring ICT for Development in Geneva (Switzerland).[3] It is to be hoped that the members of the Statistical Conference of the Americas of ECLAC, the experts on educational statistics and the members of the digital agendas of the countries of the region will jointly endorse this proposal.

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[2] United Nations Educational, Scientific and Cultural Organization (UNESCO), *ICTs and Education Indicators. Suggested Core Indicators based on Meta-Analysis of Selected International School Surveys*, Montreal, 2006.

[3] United Nations Educational, Scientific and Cultural Organization (UNESCO), *UNESCO Institute for Statistics Initiatives for Standardization of Information and Communication Technologies (ICT) use in Education Indicators*, Montreal, 2009.

Table 8
PROPOSED ICT IN EDUCATION INDICATORS

Measure	Ref	Indicators	Observations
Access	I1	Proportion of schools with a radio used for educational purposes, for International Standard Classification of Education (ISCED) levels 1-3.	Only the transmission, not the equipment, is considered.
	I2	Proportion of schools with a TV used for educational purposes, for ISCED levels 1-3.	Measurement of the type of media used (transmission, VHS, DVD and others).
	I3	Proportion of schools with computers, for ISCED levels 1-3.	Measurement of the proportion of computers used for educational, management and administrative purposes by school.
	I4	Learner-to-computer ratio, for ISCED levels 1-3.	
	I5	Proportion of schools with computer labs, for ISCED levels 1-3.	Computers in classrooms and labs.
	I6	Proportion of schools with computers connected to a local area network (LAN), for ISCED levels 1-3.	
	I7	Proportion of schools that belong to a wide area network (WAN), for ISCED levels 1-3.	
	I8	Proportion of schools with basic telecommunications infrastructure and telephony access, for ISCED levels 1-3.	
	I9	Proportion of schools with Internet access at school, for ISCED levels 1-3.	Specify the options for connectivity type and speed instead of bandwidth (dial-up, xDSL, cable modem, dedicated line, mobile Internet, satellite and others). The indicator should reveal whether the connection is broadband or narrowband.
Skills	I10	Proportion of students using the Internet at school, for ISCED levels 1-3.	
	I11	Proportion of students (by gender) at the tertiary level enrolled in ICT-related fields.	
	I12	Proportion of teachers trained in: i) Digital literacy; ii) Use of tools for educational tasks, and iii) Use of technology tools for knowledge generation.	
	I13	Proportion of schools with electricity, for ISCED levels 1-3.	Inquire before the options as to whether the electricity is supplied over the public grid or generated off the grid.

Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of United Nations Educational, Scientific and Cultural Organization (UNESCO), *UNESCO Institute for Statistics Initiatives for Standardization of Information and Communication Technologies (ICT) use in Education Indicators*, Montreal, 2009.