UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

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MEASURING ICT AND GENDER: AN ASSESSMENT

PARTNERSHIP ON MEASURING ICT FOR DEVELOPMENT

10 YEARS 2004-2014

Report prepared for the Partnership on Measuring ICT for Development

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NOTE

Within the UNCTAD Division on Technology and Logistics, the ICT Analysis Section carries out policy-oriented analytical work on the development implications of information and communications technologies (ICTs). It seeks to promote international dialogue on issues related to ICTs for development, and contributes to building developing countries' capacities to measure the information economy and to design and implement relevant policies and legal frameworks. The ICT Analysis section is also responsible for the preparation of the Information Economy Report.

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CONTENTS

LIST OF TABLES

ACKNOWLEDGEMENTS

This report, Measuring ICT and Gender: An Assessment , was based on a background paper prepared by Nancy Hafkin, UNCTAD consultant, under the overall guidance of UNCTAD and the International Telecommunication Union (ITU) in close consultation with members of the Task Group on Gender (TGG) of the Partnership on Measuring ICT for Development.

Preparation of the report was based on desk research, and on consultations with the TGG and its individual members, either in person or online, as well as with other researchers on gender statistics and gender and information and communications technologies (ICTs). Their cooperation has been invaluable in this task. Inputs were received from the following TGG members: Susan Teltscher, Esperanza Magpantay and Doris Olaya of ITU, Torbjörn Fredriksson, Scarlett Fondeur and Diana Korka of UNCTAD, Peter Wallet and Martin Schaaper of the UNESCO Institute for Statistics (UIS), David Hunter of the International Labour Organization (ILO), Remi Lang of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), Nibal Idlebi of the United Nations Economic and Social Commission for Western Asia (ESCWA), Alison Gillwald and Mariama Deen-Swarray of Research ICT Africa (RIA), Shazna Zuhyle of LIRNEasia, Sophia Huyer of Women in Global Science and Technology (WISAT), and Sonia Jorge and Karin Alexander of the Web Foundation.

The report was discussed in detail at a Partnership Expert Meeting on Gender and ICT Indicators which was held in Mexico City on 3 December 2013.[1] It was also presented, and submitted for further written comments, at the ITU World Telecommunication/ICT Indicators Symposium (WTIS) that took place in Mexico City from 4 to 6 December 2013.[2] Valuable inputs and comments were received from Nancy Volensky (Bermuda), Alexandre Barbosa and Tatiana Jereissati (Brazil), Germania Estevez (Dominican Republic), Nagwa El Shenawy, Safa Mostafa and Heba Youssef (Egypt), Ernestina Hope Turkson (Ghana), Biranchi Narayan Satpathy (India), Hock Eng Koay (Malaysia), Félix Vélez and Desiree Delgado (Mexico), Ramon Albert (Philippines), Kaoru Kimura, William Prince and Buyant Khaltarkhuu (World Bank).

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Members of the Partnership on Measuring ICT for Development are grateful to national statistical offices (NSOs) for their sharing of data and appreciate the responses received to annual survey questionnaires on measuring ICT.

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ABBREVIATIONS

DFID	Department for International Development (United Kingdom)
ESCAP	Economic and Social Commission for Asia and the Pacific
ESCWA	Economic and Social Commission for Western Asia
IAEG-GS	Inter-Agency and Expert Group on Gender Statistics (of the United Nations)
ICT	information and communications technology
IDRC	International Development Research Centre (Canada)
ILO	International Labour Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupation
ISIC	International Standard Industrial Classification
IT	information technology
ITU	International Telecommunication Union
MDG	Millennium Development Goal
NSO	national statistical office
OECD	Organisation for Economic Co-operation and Development
RIA	Research ICT Africa
SIM	subscriber identity module
TGG	Partnership Task Group on Gender
UIS	UNESCO Institute for Statistics
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSD	United Nations Statistical Division
USAID	United States Agency for International Development
WICTAD	Women, ICT and Development
WISAT	Women in Global Science and Technology
WSIS	World Summit on the Information Society

EXECUTIVE SUMMARY

This report constitutes part of the efforts by the Task Group on Gender (TGG) of the Partnership on Measuring ICT for Development (hereinafter referred to as the Partnership) to improve the availability of sex-disaggregated data, especially in developing countries. It takes stock of existing ICT indicators disaggregated by sex, assesses data availability and identifies main gaps based on an evaluation of needs and demand for such indicators. It also identifies areas covered as well as potential new areas where sex-disaggregated data are desirable, and the methodological work needed in order to develop relevant indicators to fill the data gaps. The report has been prepared as an input to the Partnership's work on measuring ICT and gender, and is intended to serve as a basis for further discussions with countries on this subject.

The major reason for defining and collecting gender-related statistics on ICT is to identify and document variations in access to and use of ICT by men and women in order to inform national policy and set international policy goals as a necessary prerequisite for the achievement of a globally equitable information society. The importance of this undertaking has been affirmed in many forums, including the World Summit on the Information Society (WSIS) and in the Millennium Development Goals (MDGs) of the United Nations.

When data is collected in aggregate form, it masks gender differences, so that the situation of women is unrecorded and ignored, not only in statistics but also in policy formulation. As ICT becomes increasingly vital to innumerable aspects of everyday life globally, attention is being directed to digital divides, among which the gender divide is a major concern.

Collection of ICT-related sex-disaggregated statistics ensures that the realities of both men and women are reflected in national ICT data, thereby providing the basis for gender-inclusive policy and planning. The paucity of sex-disaggregated ICT data, particularly from developing countries, makes it difficult to highlight the need for policymakers to address gender issues in ICT policies, plans and strategies. Encouraging the collection of such ICT statistics and indicators is particularly important in developing countries because of the enormous gender-based disparities of access and use of ICTs, as well as opportunities that ICTs can offer girls and women in these countries.

The Partnership on Measuring ICT for Development, established in 2004, has developed a core list of ICT indicators. The latest version of the list (2013) includes 57 indicators, 12 of which are collected and disaggregated by sex (annex).

This report describes the efforts to collect gender-disaggregated ICT statistics by the Partnership and TGG members, including the International Telecommunication Union (ITU), the UNESCO Institute for Statistics (UIS), UNCTAD, the International Labour Organization (ILO), the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the United Nations Economic and Social Commission for Western Asia (ESCWA), Eurostat, the Organisation for Economic Co-operation and Development (OECD), LIRNEasia, Research ICT Africa, Women in Global Society and Technology (WISAT) and the World Wide Web Foundation. Other international efforts and studies to define indicators and measure gender and ICT are also outlined. It is necessary, however, to distinguish between data that can be compared internationally, which is the objective of the Partnership, and other efforts to collect and disseminate data.

The almost complete absence of ICT statistics and indicators from international statistics and indicators on gender equality is underlined in the hope that improved communications between the communities involved in gender statistics and ICT statistics, respectively, will help advance measurement at the intersection of gender and ICT. The United Nations Inter-Agency Expert Group on Gender Statistics (IAEG-GS) has taken encouraging steps in this direction.

There is demand for a great variety of information about the relationship between gender and ICT in various realms. Based on a survey of the literature on gender and ICT, this report identifies areas of high demand for

gender-related indicators, and offers proposals for sex-disaggregation of existing indicators and the addition of new indicators in line with Partnership principles and aims. Notably, those indicators should:

- Be of relevance to policy-making relating to the information society at national, regional and international levels
- Be simple, realistic and measurable
- Be conceived with a view to a high probability of country responses
- Keep the burden of data collection to a minimum

The areas covered by the proposed changes, where internationally comparable, reliable gender-related data are lacking include ICTs and education, access to and use of ICTs, barriers to the Internet, employment in the ICT sector itself and in ICT occupations across many sectors, ICT in the workforce and in entrepreneurship, and several aspects of mobile phone use, particularly in developing countries.

The suggested list for measuring gender and ICT comprises the following:
i) Revisions to existing core indicators/surveys,
ii) Proposed new indicators, some of which necessitate further development work, and
iii) Existing core indicators, some of which involve data collection issues, as shown in table 1.

The proposed indicators cover the following categories: household/individual use, employment, education, business and small-business owners. Two areas are highlighted for consideration in future revisions and development of indicators: gender equality in broadband access and gender-based violence.

Collection of data on these indicators would be an important step towards building inclusive information societies.

TABLE 1. EXISTING CORE INDICATORS, SUGGESTED REVISIONS AND PROPOSED NEW INDICATORS FOR MEASURING GENDER AND ICTS

INDICATOR CODE	INDICATOR	EXISTING/PROPOSED REVISIONS TO EXISTING INDICATOR/ PROPOSED NEW INDICATOR	FURTHER WORK NEEDED
HOUSEHOLD/INDIVIDUAL ICT USAGE			
HH1, HH2, HH3, HH4, HH6, H11, HH13, HH14, HH16	Household access indicators	Existing Filter question on sex of household head	No change
HH5	Proportion of individuals using a computer	Existing	No change
HH7	Proportion of individuals using the Internet	Existing	No change
HH8	Proportion of individuals using the Internet, by location	Existing	No change
HH9	Proportion of individuals using the Internet, by type of activity	Existing	No change
HH10	Proportion of individuals using a mobile cellular telephone	Existing	No change
HH12	Proportion of individuals using the Internet, by frequency	Existing	No change
HH15	Individuals with ICT skills, by type of skills	Existing	No change
	Proportion of individuals who own a mobile phone	Proposed new indicator	Definition of mobile phone ownership
	Proportion of individuals using a mobile phone, by type of activity	Proposed new indicator	Development of responses on mobile phone activities
	Proportion of individuals not using the Internet , by type of barriers	Proposed new indicator	Development of list of barriers to Internet access by individuals
EDUCATION			
ED6	Proportion of learners who have access to the Internet at school	Existing	No change
ED7	Proportion of learners enrolled at the post-secondary level in ICT-related fields	Existing	Data are currently not available for this indicator. UNESCO to collect data on this indicator.

continued

TABLE 1. EXISTING CORE INDICATORS, SUGGESTED REVISIONS AND PROPOSED NEW INDICATORS FOR MEASURING GENDER AND ICTS

INDICATOR CODE	INDICATOR	EXISTING/PROPOSED REVISIONS TO EXISTING INDICATOR/ PROPOSED NEW INDICATOR	FURTHER WORK NEEDED
ED8	Proportion of ICT-qualified teachers in schools	Existing	
	Proportion of primary and secondary schoolteachers trained to teach subjects using ICT facilities (ISCED* levels 1-3) (sex disaggregated)	Proposed new indicator	Based on non-core indicator ED38
	Proportion of pupils enrolled in programmes offering computer assisted instruction (ISCED levels 1-3) (sex disaggregated)	Proposed new indicator	Based on existing indicator
	Proportion of pupils enrolled in programmes offering Internet-assisted instruction (ISCED levels 1-3) (sex disaggregated)	Proposed new indicator	Based on existing indicator
	Proportion of pupils enrolled in programmes offering courses in basic computer skills or computing (ISCED levels 1-3) (sex disaggregated)	Proposed new indicator	Based on existing indicator
	Proportion of graduates in ICT-related fields at post-secondary non-tertiary and tertiary levels (sex disaggregated)	Proposed new indicator	Based on non-core indicator ED46
EMPLOYMENT			
ICT1	Proportion of total business sector workforce involved in the ICT sector	Proposed revision: disaggregated by sex	Disaggregate indicators by sex
	Proportion of employees in ICT occupations	Proposed new indicator	Definition and measurement of ICT occupations
BUSINESS			
B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, B12	Indicators for business access and use	Proposed revision: addition of filter question on gender composition of business employees	Precise formulation of filter question to be determined: male/female dominated, neutral
SMALL-BUSINESS OWNERS			
	Proportion of small-business owners using the Internet (sex disaggregated)	Proposed new indicator	Elaboration and implementation of a survey of owners of micro and small businesses, with an ICT module included Development of responses on Internet, by type of activity
	Proportion of small-business owners using mobile phones (sex disaggregated)	Proposed new indicator	
	Proportion of small-business owners using mobile phones, by type of activity (sex disaggregated)	Proposed new indicator	
	Proportion of small-business owners using the Internet, by type of activity (sex disaggregated)	Proposed new indicator	
E-GOVERNMENT			
EG1	Proportion of persons employed in central government organizations routinely using computers	Existing	No change in definition. Data currently not available; it should therefore be collected for this indicator.
EG2	Proportion of persons employed in central government organizations routinely using the Internet	Existing	No change in definition. Data currently not available; it should therefore be collected for this indicator.

Note: * ISCED is UNESCO's International Standard Classification of Education.

RECOMMENDATIONS

Proposed actions by the Partnership

Continued improvement in the collection of ICT data at the individual level, particularly from developing countries, is key to obtaining gender-related ICT statistics. Most importantly the Partnership should continue its efforts to encourage national statistical offices (NSOs) and other official statistical entities in developing countries to collect individual-level ICT data, with sex as a classificatory variable.

The Partnership as a whole and its members individually need to raise awareness among policymakers and data producers of the importance of sex-disaggregated ICT statistics, emphasizing that individual-level ICT statistics can be collected through existing surveys that allow for disaggregation by sex and without the need for allocating additional resources.

The Partnership, through the Task Group on Gender (TGG), should continue and increase its interaction with the gender statistics community, especially through the IAEG-GS, to foster awareness of the importance of ICT to gender issues.

Particular efforts should be made to promote the collection of data on the use of mobile cellular phones by individuals, especially in developing countries, because in many of these countries they are the most-used form of ICT, especially by girls and women.

The Partnership and the TGG should continue working with NSOs to establish, and revise as necessary, internationally comparable gender and ICT indicators that can be used by all countries in their nationally representative data collection activities, taking into consideration previous efforts, manuals and guidelines produced by the Partnership.

At national level

National statistical offices (NSOs), in collaboration with ICT policymakers, should consider the integration of a gender perspective into ICT data from the first stage of planning data collection, and when setting out the objectives of a survey or census.

Equally important as promoting an awareness of gender is the need for collecting internationally comparable statistics in order to facilitate sound analysis and the development of effective policies and programmes to promote gender equality.

While an ICT survey is the most desirable, as it can contain a large number of questions, for practical and financial reasons, among others, this may not be possible. In that case, the inclusion of ICT questions in a module in existing surveys, such as in a census or labour force survey, is also valuable.

Moreover, the survey(s) should aim to avoid gender bias and ensure that the situation of girls and women is properly reflected in individual-level ICT data through guidelines, manuals and training of supervisory and field personnel.

Last but not least, NSOs should disseminate widely the results obtained from their data collection.

CHAPTER I.
INTRODUCTION

A. OBJECTIVE OF THIS REPORT

This report constitutes part of the efforts of the Partnership on Measuring ICT for Development through its Task Group on Gender (TGG) to improve the availability of internationally comparable sex-disaggregated data, especially in developing countries. In addition to being of interest to the Partnership and national statistical offices (NSOs), it should also be useful to all those concerned with ensuring e-inclusion in the information society. The membership of the TGG is led jointly by ITU and UNCTAD, and includes the UNESCO Institute for Statistics (UIS), the United Nations Economic and Social Commission for Western Asia (ESCWA), the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP),the International Labour Organization (ILO), LIRNEasia, Research ICT Africa (RIA), Women in Global Science and Technology (WISAT) and the World Wide Web Foundation. To achieve its goals, the Task Group also collaborates with other organizations, including the IAEG-GS and the Women, ICT, and Development (WICTAD) International Forum.

The report seeks to achieve the following objectives:

- Take stock of existing ICT indicators disaggregated by sex, assess data availability and identify main gaps, at the country and regional levels, based on an evaluation of needs and demand for such indicators; and
- Identify areas covered, as well as potential new areas where sex-disaggregated data are desirable, determine the methodological work needed to develop relevant indicators and address data gaps.

It pays special attention to identifying indicators relevant to gender and ICT in developing countries and represents the first step in the work of the TGG. The second stage will be to develop the statistical standards related to new proposed indicators and define priority areas for measurement, in consultation with countries and relevant existing expert groups.

B. THE NEED FOR GENDER STATISTICS

The main reason for defining and collecting gender statistics on ICT is to identify and document variations in access to and use of ICT by sex in order to inform national policy and set international policy goals**.** The collection and analysis of ICT gender statistics is a necessary prerequisite for the achievement of a globally equitable information society.

Men and women the world over have different realities, roles, positions and constraints. Too often the situation of men is taken to be the norm for both men and women, thus ignoring the differences between them. The 2012 Gender Inequality Index of the United Nations Development Programme (UNDP)[3] shows that no country in the world has achieved gender equality. Most women tend to be poorer than men, and in many countries they are less educated. Indeed, the majority of the world's illiterates are women. Women in general tend to earn less, hold fewer positions of power and make fewer decisions in the family, in businesses, and in political and public life. These inequalities affect the ability of women to benefit equally from the opportunities offered by ICTs and contribute fully to shaping the development of the global knowledge economy and society.

Redressing gender equalities as a matter of equal rights is not the only reason for addressing gender-related issues in ICT; there is also a clear economic case for promoting gender equality. Research shows that closing gender gaps could lead to substantial increases in per capita income (United Nations, 2013). The roles of women in social development are unquestionable, particularly in the education of children, and in ensuring the health and well-being of their families. In both their social role as family caretaker and their production roles, women can profit from ICTs, as these can often obviate the need for their mobility, help overcome barriers to access to information and increase their economic opportunities, thus contributing to poverty alleviation. Many forums have highlighted the important role that ICTs can play in all aspects of economic and social development. And, undoubtedly, the full participation of both men and women in access to and use of ICTs will increase the positive impact of these technologies. However, maximizing such participation requires knowledge of any existing gender inequities.

Aggregate data collection masks gender differences, which implies that women's realities remain unrecorded and are ignored, not only in statistics but also in policy. This realization underlies the push for gender statistics. As ICTs become increasingly vital to innumerable aspects of everyday life globally, attention is being directed to digital divides, among which

the gender divide is a major concern.[4] Collection of gender-related ICT statistics is being undertaken in an effort to ensure that the situation of both men and women is reflected in national ICT data in order to provide the basis for gender-inclusive policy and planning (UNDESA, 2013).

Without data there is no visibility; without visibility there is no priority

The paucity of sex-disaggregated ICT data, particularly from developing countries, makes it difficult, if not impossible, to make the case to policymakers for their consideration of gender-related issues in ICT policies, plans and strategies. The lack of adequate data resulting from the scarcity of gender statistics affects policy and its implementation. Indeed, the dearth of gender-specific data available to policymakers is reflected in the absence of gender awareness in ICT and ICT-related policies and in the undertaking of costly gender-related initiatives on the basis of insufficient evidence.

Internationally comparable ICT gender statistics would provide insight into the use of ICT for economic and social development. They would enable a better understanding of the different ways in which men and women experience ICTs and would present a more accurate picture of the scope and intensity of the gender-based digital divide. Such statistics are necessary to ensure economic efficiency and national development based on the full utilization of human resources, which is especially important in a global knowledge society. The desired result would be that men and women contribute more equally to the building of national knowledge societies; the cost of their not doing so is immense.[5]

The concern for gender and ICT statistics and indicators is broad-based. ICT is not an isolated area; it permeates such fields as education, health, governance, agriculture, finance, labour, and science and technology, all of which have gender issues. The outcome of gender inequities is that ICT policies, strategies, programmes and projects are not gender-neutral. ICT impacts men and women differently. Both technology and gender are socially constructed, and social attitudes and norms influence the relationship between the two.[6] Women face many disadvantages with regard to new technologies, such as social norms about appropriate behaviour of women, cultural attitudes, gender-based division of labour, gender stereotypes and even gender-based violence. As a result, they often have less access to, less use of and fewer benefits from such technologies.[7] On the other hand, women may have more to gain from ICT than men, in terms of time, freedom and opportunities.

The widely acknowledged role of women in the achievement of all the Millennium Development Goals (MDGs), adopted in 2000 to provide a framework for the promotion and monitoring of poverty reduction and improvement of quality of life in developing countries, leads to the inevitable conclusion that ICTs need to incorporate a strong measure of gender awareness to achieve their targeted impact on the goals.[8] The policy implication of gender disparities in access to and use of ICTs, especially for developing countries, is that, unless special interventions are made, most women will not benefit as much from the information society as men. Variations in ICT access and usage by men and women suggest the need for special attention to gender issues with a view to promoting gender equality and fully utilizing a country's human potential. The first step in doing this is the collection of data that help identify possible inequalities and problems. If ICT always affected men and women similarly, it would not be necessary to distinguish the situation of women, and sex-disaggregated statistics would not be needed to inform policy-making.

C. EVOLUTION OF GENDER-RELATED ICT STATISTICS

The past 10 to 15 years have seen tremendous advances in the availability of Internet and mobile telephones, as well as the development of myriad new applications and functions for these technologies and the increasing convergence between them. Internationally comparable statistics and indicators are required to document their spread, the places and frequency of use, and the impact they have on the economic and social development of countries, and to be able to compare developments across countries.

With the growing awareness of the tremendous impacts of the new technologies has come a drive to understand their social impacts, to know which individuals use which devices, for what purpose, where and to what effect. The awareness of inequalities among beneficiaries and the need for e-inclusion has led to calls for disaggregated measures of access and

use. With this has come the emergence of interest in gender-related ICT statistics and indicators.

Gender-based categories are not homogeneous; there can be tremendous variation within any population of women in any given country with regard to age, ethnicity, education, skills, employment, income and geography, among other factors. Scholars have argued that some of these categories – individually or in groups – are greater determinants of the relationship to ICT than gender. It is therefore important to look at gender in relation to these other categories in order to obtain a nuanced view of gender and ICT. For example, RIA's research in 12 African countries showed that education and income were stronger determinants of ICT access and use than gender. Socio-cultural factors that cause a higher concentration of women in the uneducated, unemployed and poor segments of society also marginalize them in terms of access and use of ICTs.[9] Another study showed a positive correlation between women and ICTs when gender inequalities are removed and women are placed on an equal footing with men.[10] But since these inequalities exist, even in developed countries, they need to be taken into account.

Several measures adopted by the United Nations led to awareness of the need for collecting gender and ICT statistics. An initial stimulus came from the 2001 Economic and Social Council resolution E/2001/L.29 on Social and Human Rights Questions: Advancement of Women, which called for "mainstreaming a gender perspective into all policies and programmes in the United Nations system." The Commission on the Status of Women session focused on women, media and communication (2003) highlighted gender and ICT statistics and indicators, and recommended that governments and relevant United Nations agencies and organizations "...increase efforts to compile and disaggregate, by sex and age, statistics on ICT use, in order to develop gender-specific indicators on ICT use and needs, and to collect gender-specific data on employment and education patterns in the media and in ICT professions".[11]

The World Summit on the Information Society (WSIS), in its first phase (Geneva, 2003), recognizing the lack of gender-related indicators, recommended the following corrective action: "Gender-specific indicators on ICT use and needs should be developed and measurable performance indicators should be identified to assess the impact of funded ICT projects on the lives of women and girls."[12]

The Geneva Declaration of Principles (2003) emanating from the WSIS stated that it was "... fully committed to an Information Society that enables women's empowerment and full participation in all spheres of society and [in] all decision-making processes."

Although the WSIS Plan of Action (2003) mentioned the need for gender analysis to be included in an ICT development index and for the generation of statistics to set up the index,[13] it made no reference to the collection of sex-disaggregated data, which are the basis for developing gender-specific indicators, and it set no gender-specific targets.

D. ABOUT THE PARTNERSHIP ON MEASURING ICT FOR DEVELOPMENT

The Partnership on Measuring ICT for Development, launched at UNCTAD XI in Sao Paulo in 2004, was mandated in the Tunis agenda (emanating from the second phase of WSIS in 2005) to support WSIS efforts to develop specific sex-disaggregated indicators to measure the various dimensions of the digital divide.[14] The objective of the Partnership was to provide reliable, internationally comparable indicators across countries to document the spread of ICT for development.

Considerable progress was made in 2005 in the collection of sex-disaggregated ICT statistics with the addition by the ITU of individual-level data in household surveys of ICT use, and, in 2007, by the disaggregation by sex, among other classificatory variables. Seven individual-use indicators were established at this time (see table 2), with multiple responses possible for three of them (HH8, HH9 and HH12). It was suggested that sub-indicators be constructed using the individual classificatory variables of age, gender, highest education level, employment status and occupation.[15]

The importance of including questions on individual use in the household surveys cannot be over-emphasized. In their absence, there was no way to disaggregate individual use at the household level, which is essential to understanding gender differences, since access to ICT in the household as a whole does not guarantee its use by all persons in that household. Another advantage of collecting core indicators on

TABLE 2. PARTNERSHIP'S CORE INDICATORS WITH POSSIBILITY OF DISAGGREGATION BY SEX (SITUATION IN 2007)	
INDICATOR ID	**INDICATOR**
HH5	Proportion of individuals who used a computer in the past 12 months
HH6	Proportion of households with Internet access
HH7	Proportion of individuals who used the Internet in the past 12 months
HH8	Location of individual use of the Internet in the past 12 months
HH9	Internet activities undertaken by individuals in the past 12 months
HH10	Proportion of individuals who used a mobile cellular telephone in the past 12 months
HH12	Frequency of individual use of the Internet in the past 12 months

Source: United Nations Statistical Commission, 2009.

individual use is that they permit questions about the use of technologies not only at home, but also at other places, and they can be disaggregated by age and educational level.

ITU's recently issued policy on Gender Equality and Mainstreaming, which underlines the basic case for gender statistics and indicators, could further boost the work of the Partnership on gender statistics and indicators. As stated in a report of the Secretary-General of the ITU:

As the United Nations specialized agency for ICTs, ITU's overall mission is "Connecting the World". In this context, including a gender perspective in ITU's work is essential to ensure that the benefits of ICTs are made available to all women and men on a fair and equitable basis.[16]

E. THE PARTNERSHIP TASK GROUP ON GENDER

The TGG, jointly led by UNCTAD and ITU, was set up in 2013 to cater to the increasing demand for internationally comparable sex-disaggregated and other gender-related ICT data. The objective of the TGG is to build on the previous work of the Partnership and improve the availability of internationally comparable indicators on gender and ICTs, especially in developing countries. Better, more transparent, comparable and comprehensive statistical information on ICTs and gender will enable an assessment of possible gender gaps in access to and use of ICTs and improve the ability of governments to design, implement and monitor ICT-related policies, projects and initiatives in relevant areas.

The TGG includes members of civil society and organizations outside the Partnership, which have experience in collecting and disseminating ICT statistics at regional and/or international levels. Current members of the TGG are: ITU, UNCTAD, UIS, UNESCAP, UNESCWA, ILO, LIRNEasia, RIA, WISAT and the World Wide Web Foundation.

The TGG works in consultation with producers of national statistics, such as NSOs and other responsible authorities, to establish common methodologies and guidelines for internationally comparable indicators. The first report of the TGG was discussed in detail at the Partnership Expert Meeting on gender and ICT Indicators, which was held on 3 December 2013 in Mexico City. It was then presented and submitted for further written comments to national delegations attending the ITU World Telecommunication/ICT Indicators Symposium (WTIS) which took place in Mexico City from 4 to 6 December 2013. The second stage in the work of the TGG will be to develop statistical standards related to the new proposed indicators and define priority areas of measurement, in consultation with countries and relevant expert groups.

CHAPTER II.
MEASUREMENT OF GENDER AND ICT

A. MEASUREMENT OF GENDER AND ICT WITHIN THE PARTNERSHIP AND ITS TASK GROUP ON GENDER

This chapter summarizes the work on gender-related ICT indicators of the Partnership and its TGG members, as well as that of others working on international statistics.

Partnership core indicators

The core list of ICT indicators of the Partnership on Measuring ICT for Development, in the latest version (2013), comprises 57 indicators, covering the following: ICT infrastructure and access, access to and use of ICT by households and individuals, use of ICT by businesses, the ICT sector, trade in ICT goods, ICT in education and e-government (annex). Of the 57 indicators, 12 can be collected and disaggregated by sex, 7 fall within the purview of ITU, while the UNESCO Institute for Statistics is responsible for 3 of them. To date, no international agency collects the two individual-level indicators of e-government, as they have not yet been widely tested.[17] So far, none of the business indicators is disaggregated by sex.

Activities of Partnership members on gender-related statistics

ITU

The ITU has long experience in defining and collecting internationally comparable telecommunication/ICT indicators, and has played a key role in standardizing their definitions. The first indicators collected with sex disaggregation were those on telecommunication staff (full-time- equivalent telecommunication employees) and Internet users. The data were provided by telecommunication operators and authorities from various countries. More recently, in 2005, and closely linked to the WSIS, the ITU expanded its statistical work to cover household statistics by collecting data on ICT household indicators from national statistical offices. As an active member of the Partnership on Measuring ICT for Development, the ITU has contributed to the development of the core list of ICT household indicators, including their definitions, through consultations with stakeholders and the preparation of relevant methodological documents. In 2007, it started collecting sex-disaggregated data on these ICT household indicators annually through its questionnaire sent to NSOs, which collect this information through national household surveys. Core indicators on aspects of individual use of ICT can now provide information on the gender dimension.

In addition to gender, data for each of the individual ICT-use indicators collected are broken down by age, urban/rural location, educational level, labour force status and occupation of the users. These indicators are in turn broken down by gender (for example, by age and gender simultaneously), but not all countries report them since sample design and sizes do not necessarily allow for such a level of disaggregation in household surveys. By 2011, ICT-use data were reported by 38 developing countries (up from 30 in 2008) and 38 developed countries.[18] The ITU has also been delivering training courses on measuring ICT access and use by households and individuals in developing countries.

It disseminates the sex-disaggregated data that it collects in a number of forms, including the electronic database, *World Telecommunication/ICT Indicators* (WTI) database, the *Yearbook of Statistics* and its website. Its report, *Measuring the Information Society* (MIS), 2011, includes a chapter on Internet use, which analyses the gender dimension.

The ITU also participates in the IAEG-GS, which considers three ICT-related indicators in its minimum set of gender indicators. The ITU is currently contributing with data for two of them: the proportion of individuals using the Internet and the proportion of individuals using a mobile cellular telephone.

UNCTAD

UNCTAD currently collects data on 12 core indicators that measure the use of ICT in business. While gender has long been identified as an important dimension of the digital divide, at the time when the core indicators were proposed, it was not clear how the business indicators and data could be disaggregated by sex, and therefore none of these is currently disaggregated by sex. The present report makes a few proposals on how this issue could be addressed.

UNCTAD has been extensively involved in examining issues related to gender in the information economy, notably in its *Information Economy Report* of 2010 that covered in-depth the linkage between women, ICT

and the information economy and poverty alleviation. The subsequent report contained a chapter on women entrepreneurship and ICT.[19]

UNESCO Institute of Statistics

The UNESCO Institute of Statistics (UIS) has been deeply involved in the disaggregation of education statistics and indicators by sex for more than 50 years. Based on administrative data on pupils and teachers, it helps to monitor progress in the achievement of the gender-related aspects of the MDGs and Education for All (EFA).

The Institute is internationally mandated to administer statistical data collection on the availability, use and impacts of ICT in education. By 2013, it had collected data from 86 developing and 12 developed economies, which it has published along with accompanying analytical reports. In relation to ICT and gender, the UIS collects sex-disaggregated data on enrolment in programmes offering various types of ICT-assisted instruction as well as on the training of teachers. It has also been developing statistical capacity in different regions by holding workshops for representatives from national statistical offices and relevant ministries, particularly ministries of education.

United Nations Regional Commissions

Only some of the regional commissions collect ICT data; [20] others publish ITU's ICT data.

Economic Commission for Africa

The Economic Commission for Africa has two initiatives that collect sex-disaggregated and gender-related data from its member States. It has developed an African database entitled Scan ICT, covering 62 core indicators, with both age and gender as classificatory variables within its individual indicators. While the database has not been updated recently, the ECA is continuing the Scan ICT programme with NSOs in Morocco, Namibia and Nigeria. The participating countries generally use the Partnership's core indicators.[21]

The ECA also has a regional entry in the composite gender index field in the African Gender and Development Index (AGDI), which, notably, of all the composite gender equality indexes, includes an indicator on the inclusion of gender issues in the technology policies of African States, explicitly including ICT.[22] The index-related data collection has been applied in 30 African countries.

Economic and Social Commission for Asia and the Pacific

ESCAP does not collect ICT data from its member States. It conducted a review of national gender statistics collection in 2012, wherein slightly more than a quarter of the respondents said they never collected gender and ICT statistics, while a similar proportion reported collecting them regularly.[23] However, the response rate was less than half of ESCAP's membership, and did not include mainland China, India and the Republic of Korea (which has extensive gender and ICT statistics). Significantly, no country identified ICT as an area where it planned to expand its production of gender statistics.

Economic and Social Commission for Western Asia

In the past decade ESCWA started a project on Arab Women in Science and Technology, which included a list of indicators that were adopted by high-level decision-makers from 15 Arab countries. With sex-disaggregated data available only from Egypt, Jordan and Palestine, the secretariat discontinued the project and urged all Arab member States to collect sex-disaggregated data in technical and scientific areas. The 2013 ESCWA Expert Group Meeting on the Role of ICT in Socio-economic Development recommended bridging the gender digital gap in the region. ESCWA is also undertaking a study on the impact of ICT on Arab youth, with a particular focus on gender issues, including the potential of ICT for women's empowerment in higher education and employment.

The 2012 review of gender statistics in ESCWA member States, based on responses from 13 (of 14) States, showed that all NSOs had at least a gender focal point, but none of the respondents reported having an ICT government entity for collecting gender statistics. However, seven countries reported that they produced gender and ICT statistics regularly, three reported they did so irregularly and two never produced any. No country reported gender and ICT as part of any statistics expansion plan, even though they did list gender as a field to be accorded national priority.[24]

Economic Commission for Latin America and the Caribbean (ECLAC)

With assistance from the International Development Research Centre (IDRC), Canada, the Economic Commission for Latin America and the Caribbean (ECLAC) established the Observatory for the

Information Society in Latin America and the Caribbean (OSILAC) in 2004 to promote the creation of ICT statistics.[25] OSILAC worked with NSOs of the region to include ICT indicators in existing household surveys and promoted the Partnership core indicators on ICT, with gender as one of the individual variables.[26]

ECLAC presented its gender and ICT data in the context of women's economic empowerment, gender equality and ICT at the 12th Regional Conference on Women in Latin American and the Caribbean, held in the Dominican Republic in October 2013.[27] ECLAC also maintains a database on gender equality through its Gender Equality Observatory for Latin American and the Caribbean, but none of the indicators in this database refer to ICT.[28]

EUROSTAT

Eurostat has extensive statistics on the information society that cover the ICT sector, broadband and connectivity, ICT usage by households, individuals and enterprises and e-public services. Indicators of ICT usage by household and Individuals are broken down by gender, among a number of other classificatory variables, including age and educational attainment.[29] There are several individual-level variables including many relating to online purchases and problems encountered therein, willingness to pay for online content and use of online public services.[30]

OECD

The OECD collects a large number of individual-use ICT indicators from its members based on its model survey on ICT usage by households/individuals (2005).[31] The survey questionnaire is being updated to increase the number of breakdowns and variables.[32] The current questionnaire includes queries about viruses and protection therefrom, good computer practices (e.g. back-up), most recent use of the Internet and access to the Internet by other than broadband. There are also detailed questions on Internet purchase of goods and services, which may be less applicable in non-OECD countries.[33]

In its *Guide to Measuring the Information Society* (2011), the OECD publishes tables on the Partnership's core ICT indicators of household and individual use, as well as of ICT use in education, for non-OECD economies. They list economies, individual indicators and their availability for 2009 or latest year.[34] The OECD Directorate for Science, Technology and Industry is collecting a set of sex-disaggregated indicators (comparable to those of the Eurostat database) for non-European OECD countries.[35] The OECD also has a gender data portal, but none of the data relate to ICT.[36] In 2006, the OECD published a paper on gender and ICT that covered a number of aspects of employment, access to ICT and gender differentials in ICT use in developed countries.[37]

B. GENDER-RELATED ICT STATISTICS AND INDICATORS OF OTHER TGG MEMBERS

International Labour Organization (ILO)

All individual-level official statistics compiled and disseminated by the ILO are disaggregated by sex, when this is possible and meaningful. In 1993, the ILO launched the SEGREGAT database, containing statistics on employment and detailed occupational groups disaggregated by sex, to measure and analyse occupational segregation of men and women. The database now covers 85 developed and developing countries, but has not been updated since the early 2000s.[38] Data on employment in ICT occupations are available only to the extent that the national and international occupation classifications used in the database allow for their separate identification. According to the ILO, sex-disaggregated labour statistics are becoming more widely available, as many NSOs are mainstreaming gender in the production and presentation of labour statistics.[39]

The most recent ILOSTAT database includes sex-disaggregated data on employment of ICT professionals, as defined in the International Standard Classification of Occupations, 2008 (ISCO-08). Data on ICT professionals are currently available for 25 countries globally for the years 2009 and 2010. This occupational group represents a very important component of the workforce engaged in the production of ICT goods and services.[40] The ILO also disseminates statistics on employment, hours worked and earnings classified by sex, of economic activity at the most aggregate level of division of the relevant version of the International Standard Industrial Classification (ISIC).

LIRNEasia

LIRNEasia[41] has been studying mobile phone ownership and use, especially for productive purposes.[42]It has a rich database of sex-disaggregated data on mobile phone use by low-income individuals in a number of Asian countries. Between 2005 and 2011 it completed four studies of the population segment considered to be at the base of the pyramid (i.e. belonging to socio-economic groups that earn an average individual income of approximately $2 per day),[43] living in both urban and rural areas. The multi-country studies covered Bangladesh, India, Indonesia, Pakistan, the Philippines, Sri Lanka and Thailand.

LIRNEasia is currently completing an urban microentrepreneur survey of those same income groups, collecting data disaggregated by sex in Bangladesh, India and Sri Lanka. The survey focuses on how the urban microenterprises use telecommunications, electricity and government services and interact with these service providers. LIRNEasia contributed its tele-use data to the GSM Association mWomen (GSMA mWomen) initiative.

Research ICT Africa (RIA)

Based in Cape Town (South Africa), RIA[44] is an independent network of researchers covering 20 African countries across geographical and linguistic zones. Since 2005, it has produced large data sets disaggregated by sex from its ICT access and use surveys. Its samples are nationally representative of rural and urban areas for households and individuals 15 years or older, and are based on census-sampling frames from national statistical offices.

RIA's survey data are unique for a region where neither special ICT surveys nor the inclusion of sex-disaggregated ICT indicators in household and individual user surveys is common. Sex-disaggregated individual-level indicators cover the platforms of mobiles and computers, and the topics of mobile money, e-government and e-health. In 2010, RIA published its *Gender Assessment of ICT Access and Usage in Africa* of 17 countries using gender analysis of sex-disaggregated ICT indicators and other variables, combined with qualitative data from focus group discussions.[45] This study was updated in 2013 with the publication of *Lifting the Veil on ICT: Gender Indicators in Africa.*[46] One of RIA's findings is that "men and women are not able to access and use ICTs equally [in Africa] and that the fundamental reason for this lies in the gender disparities found in income and education." The conclusions stress the importance of policy intervention to ensure social and economic inclusion of women through targeted ICT interventions.

Women in Global Science and Technology (WISAT)

Since 2007, WISAT, in cooperation with ORBICOM, Elsevier Foundation and the Organization for Women in Science for the Developing World (OWSD), has developed a framework for quantitative and qualitative research on women in the knowledge society entitled *Gender Equality in the Knowledge Society* (GEKS). The framework starts with the base conditions for socio-economic and political development that determine the ability of both women and men to contribute to the knowledge society, and incorporates indicators relating to the ability of women and men to participate in the knowledge society. The quantitative framework combines indicators available from international statistical sources on science and technology, education, gender and ICT with measures of lifelong learning and women's public access to information technology and their role in the management of such information centres.[47] Using the GEKS framework, national researchers in seven countries and one region undertook studies in 2012 aimed at collecting quantitative indicators combined with qualitative research. Additional country studies were under way in 2013.[48]

World Wide Web Foundation

Founded by Sir Tim Berners-Lee in 2009, the objective of the World Wide Web Foundation is to promote an open and accessible web. The Foundation launched its Web index for 61 countries in 2012 and expanded it to 81 countries in 2013. The index combines international data from official providers with survey data gathered by means of a questionnaire completed by experts on ICT in that country, and checked against those of peer and regional reviewers. The indicators are qualitative, based on experts' opinions.[49]

The Web Index survey questions are directed at some of the major gender issues relating to ICT and the Internet, including gender-based violence (GBV). These issues relate to utilizing the web as an information source, rather than addressing any direct association between ICT and GBV; they also relate to women's leadership positions in ICT, Internet

training programmes for women and government, and measures for encouraging women to access and use the Internet. Considering the Web Foundation's concern with access and affordability, as host of the Alliance for Affordable Internet there is a notable absence in its data collection of any questions about costs of Internet access and women's disposable income to meet those costs.

C. OTHER INITIATIVES TO MEASURE ICT AND GENDER

This section describes other efforts and international research studies to define indicators and measure gender and ICT, undertaken by the United Nations, non-governmental organizations (NGOs), foundations and the private sector.

Gender Evaluation Methodology for Internet and ICTs (GEM)

The Association for Progressive Communication Gender Evaluation Methodology for Internet and ICTs (GEM)[50] is described as an initiative to measure gender benefits from ICT. GEM is directed at the project level, and combines quantitative data collection with qualitative research to evaluate the impact of ICTs on the lives of women, their families and communities. It is provides a set of guidelines for gender analysis that is most effective in creating awareness of the need for gender analysis in ICT for development projects.

Régentic

Régentic was an ambitious project undertaken from 2003 to 2005 to develop gender ICT indicators in French-speaking West Africa. Supported by the IDRC, it involved large-scale research covering a sample of nearly 7,000 persons in six West African countries. The project defined four categories for its indicators: decision-making and policy, skills, content and connectivity. All questions referred to ICT devices (defined as computers, Internet and mobile phones), which were treated as a single research entity. Questionnaires were administered to men and women, as well as to institutions, to collect data on how men and women differ in their relationships to ICT. This study also collected data on women in ICT decision-making positions and in ICT policies – fields not commonly collected.

Women and the Web

Research by Intel on Women and the Web (2013) involved 1,800 in-person and 400 online surveys – a relatively small sample for a quantitative global survey. The individual surveys of women conducted in Mexico, India, Uganda and Egypt, included questions on women's Internet usage patterns, preferences, location of usage, usage platforms, perceptions of the Internet and barriers to Internet access. Most questions were qualitative, eliciting perceptions, opinions, attitudes and beliefs, (e.g. What effect has the Internet had on your life?).[51] Some scholars have criticized the methodology, particularly in measuring the percentage contribution to GDP of increased female Internet use.[52]

Women and Mobile: a Global Opportunity

A GSM Association (GSMA)/Blair Foundation study on women at the base of the pyramid and mobile phones makes an economic case for the connection between those women's ownership of mobile phones and their empowerment. . The study data reveal a gender gap, with 300 million fewer women users of mobile phones than men in low- and middle-income countries in 2010. However, the academic community is wary of this finding as it questions the methodology used.[53]

This study appears to be motivated by a search for market opportunities among previously untapped consumer groups in developing countries and emerging market economies. GSMA envisages a market potential of 300 million women users of mobile phones. It postulates that the road to women's empowerment is through ownership (not just use) of mobile phones.

D. GENDER AND DEVELOPMENT: EQUALITY STATISTICS, INDICATORS AND INDEXES

There is a clear disconnect between gender statistics and gender-related ICT statistics. The Partnership and WSIS have promoted the collection of gender-related ICT statistics based on the belief that disaggregation by sex is an important element in working towards inclusive economic and social development linked to ICT and the information society. The gender statistics community does not seem to have a similar awareness of the importance of ICT to gender equality and women's empowerment. As the 2013 report of the Secretary-General states**, "**The production of gender statistics still focuses predominantly on traditional areas and less on emerging areas."[54]

While gender statistics are concerned with integrating a gender perspective into national statistics, it is important to consider integrating an ICT perspective into gender statistics, particularly in view of the global importance of the information/knowledge society. While nearly 40 per cent of the countries that produce national statistics reported producing gender statistics on ICT, slightly more reported that they were not producing any.[55] Few countries listed gender and ICT as a priority area.

This section briefly describes some of the major international indexes and statistical initiatives on gender and development and equality to document this disconnect. Composite gender equality indexes, most of which concentrate on economic participation and national competitiveness, are almost completely devoid of indicators or analyses of women's participation in the ICT world, whether as users or producers. The almost total absence of ICT from these composite indexes is a glaring omission. Since both gender and ICT are cross-cutting development areas, the intersection of the two should be a concern for both. Just as gender has become a category of importance in ICT for development, ICT should be given adequate attention in gender statistics. Regrettably, this is not the case.

OECD Social Institutions and Gender Index

Since 2009, the OECD has been producing the Social Institutions and Gender Index (SIGI)[56] based on its Gender Institutions and Development database. SIGI looks for the root causes of inequality based on the areas of family codes, physical integrity, son preference, civil liberties and ownership rights. It differs from several other gender indexes in that it emphasizes the social rather than economic arena. Based on a composite of indicators of each of these areas, the index calculates an inequality score and ranks countries accordingly. However, none of these data refer to ICT.

Social Watch Gender Equity Index (GEI)

The Social Watch Gender Equity Index has been produced since 2007 by the Network of East-West Women, an international NGO which serves as a communication and resource network to support research and advocacy about the status of women in Central and Eastern Europe, the Commonwealth of Independent States (CIS)and the Russian Federation. Presently covering 154 countries, the index aims to show statistically that economic development does not necessarily correlate with gender equality. It computes an average of gender inequalities in three dimensions: education, economic activity and participation in political and economic decision-making, but omits the average level of income in a country to avoid skewing rankings towards rich countries.[57] Countries such as Mongolia, Nicaragua, the Philippines and Rwanda, have ranked relatively high in this index, while richer countries such as Turkey and Saudi Arabia have ranked very low. There is no mention of ICT in any of the dimensions.

UNDP Gender Inequality Index (GII)

The UNDP GII is designed to complement its annual *Human Development Report* (HDP) and Index, which is not disaggregated by sex. The GII, introduced into the *HDP* in 2010, replaced two earlier indexes – The Gender and Development Index and the Gender Empowerment Measure (GEM),[58] both of which were criticized for being too closely tied to a country's overall level of development. The new index measures the percentage of loss in human development due to gender inequality, based on indicators of reproductive health, empowerment and labour market participation. Again, it contains no discussion of ICT.

World Economic Forum Global Gender Gap Index

In existence since 2006, this index[59] attempts to capture the magnitude of gender disparities in a

country by looking at the distribution between men and women of resources and opportunities in the economic, political, educational and health areas. Based on internationally available statistics, the index attempts to track the correlation between a country's gender gap and its national competitiveness. The index includes an indicator of the percentage of women workers in the total professional and technical workforce, but makes no specific reference to ICT in its analysis.[60]

United Nations Inter-Agency Expert Group on Gender Statistics (IAEG-GS)

In almost all the cases presented here, there is a poor interface between gender indicators and ICT indicators, especially in gender equality statistics and indicators. The work of the IAEG-GS is a significant exception, especially since 2012. At a meeting of the 2012 Global Forum on Gender Statistics at the Dead Sea, Jordan, the IAEG-GS proposed a minimum set of 52 gender indicators, including the following three related to information technology:

- Proportion of population using the Internet, by sex
- Proportion of population using mobile/cellular telephones, by sex
- Proportion of households with access to mass media (radio, TV, Internet), by sex of household head[61]

This is a very important step, which shows that the international gender statistics community realizes the significance of gender and ICT. It is hoped that the inclusion of these indicators will increase general awareness of the importance of gender considerations in ICT and lead to the addition of other related indicators to the suggested minimum list of gender indicators.

EDGE

The Evidence and Data for Gender Equality (EDGE) Initiative is a new partnership organized by the IAEG-GS to promote efforts towards comparable gender indicators on education, employment, entrepreneurship and assets. It is jointly managed by the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women) and the United Nations Statistics Division, in collaboration with member States, the World Bank, the OECD and others. The fact that EDGE is strongly supported by the IAEG-GS should bolster the collection of ICT and gender indicators in gender statistics. The objective of EDGE is to meet the demand from member States for support in accessing and using gender statistics by helping to build national capacity and strengthen national systems on data collection in critical areas. It will also promote the development of statistical standards and definitions of gender indicators.

Between 2012 and 2015, EDGE will focus on women's education, employment and entrepreneurship, areas in which ICT should figure prominently. Its long-term goal is to secure the integration of gender issues into regular statistical production and build countries' capacities to produce gender data in all critical policy areas. It is hoped that the Partnership can collaborate with EDGE on gender and ICT statistics.

CHAPTER III.
IDENTIFYING AREAS OF DEMAND AND INDICATORS

This chapter identifies areas of demand for gender-related ICT statistics and indicators based on the relevant literature. It also describes the work of the Partnership and presents existing gender indicators in relevant areas. It makes recommendations for new gender-related core ICT indicators and for updating existing indicators, and discusses methodological considerations for further work of the Partnership and its TGG.

A. IDENTIFYING AREAS OF DEMAND FOR GENDER-RELATED ICT STATISTICS

There is demand for a large variety of information about the relationship between gender and ICT in various fields. In 2013, the Partnership organized discussions to identify demand both at the WICTAD meeting in Washington, DC, and at the panel meeting on Measuring ICT and Gender at the WSIS Forum in Geneva.[62] A review of these meetings and of the literature on gender and ICT raises the following questions:

- What are the gender differences in access to ICTs – especially the Internet and mobile phones?
- What are the differences in how, where, when and why men and women use ICTs?
- What barriers do women face in accessing the Internet?
- Do women have the necessary education, training and skills required to function in the information society?
- What are the gender disparities in ICT employment and entrepreneurship?
- How can ICT help women's entrepreneurship, income generation and self-employment?
- What content do girls and women want and need? Is it accessible to them?
- How can ICTs improve the health situation of girls, women and their families in developing countries?
- What are the gender-specific ICT issues with regard to privacy, safety and security?
- What is the extent of women's representation and participation in ICT policy and governance?
- What is the impact of ICT on women's empowerment?

This list of topics informs the discussion below concerning potential indicators.

B. THE PARTNERSHIP AND GENDER ISSUES

A list of gender issues in ICT for development does not always fit easily into the standard categories of the Partnership, as per the mandates of the Partner members. In order to deal with the vast amount of literature on gender and ICT for development, it is important to define clearly what the Partnership sets out to pursue. The purpose of the gender-related data collection promoted by the Partnership is to provide a picture of the situation of girls and women compared with that of boys and men, globally and by country, with regard to the multiple areas in which they may relate with ICTs during their lives.

The Partnership aims to produce indicators that can be compared across all countries based on agreed definitions and methodologies, and using data representative of a country's population. Core indicators need to be succinct and based on certain principles. They should:

- Be of relevance to information society policy-making at national, regional and international levels
- Be simple, realistic and measurable
- Be conceived with a view to a high probability of country response
- Keep the burden of the data collection to a minimum

The resources of NSOs in developing countries influence whether certain gender-relevant and statistically definable indicators can be collected. Determining which fields are the most important and the desire to collect information on a broad range of issues must be balanced with the ability to collect the data.

In its definition of indicators, the Partnership is limited to the areas in which NSOs and partners collect ICT data. This is illustrated by the issue of mobile phones and the empowerment of women in developing countries, a topic of major interest in the field of ICT for development. The Partnership can define indicators that would measure mobile phone use and access by

men and women, respectively, in each of its domains – household/individual use, employment, education, business – but it would not be possible to establish the causal effects of ICT use on gender empowerment through national-level quantitative data collection following international standards.

Partnership indicators and data help to establish the basic facts and to provide an overall picture. The causal ("why") and impact ("to what end") questions become the work of researchers, including gender and development analysts.[63] Researchers are frequently looking for evidence of the impacts of ICT on gender, both positive and negative. For instance – have women's employment opportunities or income increased as a result of their access to ICT? Do gender conflicts about ICT access and use lead to gender-based violence? Questions of impact are most easily addressed by small-scale surveys and qualitative case studies, rather than through official statistics.[64]

Many of the listed areas of concern are already addressed by existing quantitative national-level indicators, but only limited data are available from developing countries. Others have been partially addressed, but require further coverage. The collection of internationally comparable, reliable ICT indicators cannot fulfil all the data needs for understanding gender, ICT and development. Data on some topics fall outside the domain of national statistics and need to be gathered through other means. For the time being, though, the collection of statistics on sex-disaggregated ICT penetration and use from all countries is sufficiently challenging in itself.

C. HOUSEHOLD ACCESS AND INDIVIDUAL USE OF ICT

Gender is among the classificatory variables recommended for the core individual ICT-use indicators established by the Partnership. Such indicators, to be collected by NSOs, are needed to assess a variety of gender and ICT issues, ranging from quantifying male-female differentials in computer use, to identifying gender awareness of information and services available on the Internet, and measuring gender-based gaps in ICT skills. The ITU is responsible for organizing the collection of these indicators.

C.1. Existing core ICT indicators

There are currently seven gender-related indicators among the household ICT access and individual ICT use core indicators, reflecting the latest revisions of the indicators. Methods and sources of data collection of the indicators are detailed in *Core ICT Indicators 2010* and in the *Manual for Measuring ICT Access and Use by Households and Individuals*.[65]

Data for each of the individual-use indicators are also collected and can be broken down by age and gender, urban/rural location and gender, educational level and gender, labour force status and gender, and occupation of the person and gender.[66] Since the responses are important from the gender point of view, as they enable identification of male-female differentials, all the response categories for the individual-use indicators are shown below.

HH5 Proportion of individuals who use a computer[67]

HH7 Proportion of individuals who use the Internet

HH8 Location of individual use of the Internet

- Home
- Work
- Place of education
- Another person's home
- Community Internet access facility (typically free of charge)
- Commercial Internet access facility (typically paid)
- In mobility (i.e. during a journey in a metro, bus or train, for example)

HH9 Internet activities undertaken by individuals

- Getting information about goods or services
- Seeking health information (e.g. on injury, disease, nutrition)
- Making an appointment with a health practitioner via a website
- Getting information from general government organizations
- Interacting with general government organizations
- Sending or receiving e-mails
- Telephoning over the Internet/VoIP (Voice over Internet Protocol)
- Participating in social networks (e.g. creating a user profile, posting messages, or other contributions to sites such as Facebook, Twitter)
- Accessing chat sites, blogs, newsgroups or online discussions

- Purchasing or ordering goods or services
- Selling of goods or services (e.g. eBay, Facebook)
- Using services related to travel or travel-related accommodation
- Internet banking
- Doing a formal online course (in any subject)
- Consulting wikis (e.g. Wikipedia), online encyclopaedias or other websites for formal learning purposes
- Listening to web radio
- Watching web television
- Playing/streaming or downloading games, images, videos or music
- Downloading software and applications
- Reading or downloading online newspapers or magazines, electronic books
- Looking for a job or sending a job application
- Participating in professional networks (e.g. creating user profiles, posting messages or other contributions to such sites as LinkedIn or Xing)
- Teleworking
- Managing personal/own homepage
- Uploading self/user-created content (e.g. text, images, photos, videos, music, software) to any website to be shared
- Blogging (maintaining or adding content to a blog)
- Posting opinions on civic or political issues via websites (e.g. blogs, social networks)
- Taking part in online consultations or voting to define civic or political issues (e.g. urban planning, signing a petition)
- Using storage space on the Internet to save documents, pictures, music, video, other files (e.g. Google Drive, Dropbox, Windows SkyDrive, iCloud, Amazon Cloud Drive)
- Using software run over the Internet for editing text documents, spreadsheets or presentations (e.g. Google Docs, Office 365)

This indicator comprises an extensive list of individual activities on the Internet, the responses to which, disaggregated by sex, can go a long way towards supplying gender-related information on use and content accessed. A separate, sex-disaggregated sub-indicator can be computed for each of these categories. For example, there is frequent demand for data on women's use of ICT for health, especially with regard to seeking health-related information or services. The second and third responses to HH9 cover these concerns.

Another important gender-related issue covered in HH9 is access of women to e-government services and information. Four of the responses are potential sources of data on male-female differentials in the use of e-governance services. The extent of use of e-government services by women and men, respectively, has substantial policy significance, because women in developing countries are frequently less mobile and earn lower incomes than men, and may experience discrimination or harassment in utilizing government services in person. It is desirable to know whether the numbers of women who access government information and services through the Internet are comparable to those of men , and whether women are finding the information and services they need to the same extent as men. Data in this area can also help identify gender awareness, or a lack thereof, in the services and information provided. This aspect of e-governance is addressed in the subcategories of the household- and individual-use indicator HH9, which include using the Internet to obtain information from and/or interact with general government organizations. HH9 can also provide gender-related information and illustrate gender differentials on the utilization of social media.

HH10 Proportion of individuals who use a mobile cellular telephone

This is an important indicator for examining gender differentials because of the intense interest in the mobile phone as an instrument for women's empowerment.[68]

HH12 Frequency of individual use of the Internet

- At least once a day
- At least once a week but not every day,
- At least once a month but not every week, or less than once a month

HH15 ICT skills of individuals

- Copying or moving a file or folder
- Using copy and paste tools to duplicate or move information within a document
- Sending e-mails with attached files (e.g. document, picture, video)
- Using basic arithmetic formulas in a spreadsheet
- Connecting and installing new devices (e.g. a modem, camera, printer)
- Finding, downloading, installing and configuring software
- Creating electronic presentations with presentation software (e.g. slides, including, for example, images, sound, videos or charts)

- Transferring files between a computer and other devices
- Writing a computer programme using a specialized programming language

HH15, which was added to the list of core ICT indicators in 2013, is significant because it is the first one that measures ICT skills of individuals, broken down by sex. Until now this was an area missing from the Partnership core list of indicators. In view of the lack of data on ICT skills, adult literacy rates and gross secondary and tertiary-level enrolment rates were used as proxy indicators for ICT skills in the ICT Development Index (IDI).[69] Information on ICT skills has also been largely absent from international standard statistics, except for those of the more developed countries and economies. Eurostat's household and individual usage questionnaire first collected data in 2011 on e-skills related to both computer use in general and Internet skills in particular. The data collected on ICT skills was disaggregated by sex through two indicators for the first time in 2011.[70]

The ICT skills in HH15 are listed more or less in ascending order of difficulty: the first three could be regarded as requiring basic skills, the next five as requiring a low to moderate level of skills and the last involves substantially higher skills..

The inclusion of individual-level indicators on the Partnership's core list does not guarantee that they will be collected by many developing countries. Fewer than one third of the countries in Africa, the Arab States and Asia and the Pacific collect the data, and in the Americas and the Commonwealth of Independent States (CIS) roughly two fifths of countries collect them (table 3).

The basic problem is that NSOs in many developing countries do not collect data on ICT indicators in the first place, or collect only a few indicators on household access to ICT but not on individual usage of ICTs. Those few that do collect usage data normally can disaggregate them by sex since this is a standard classificatory variable in the household survey. Of those that report ICT-use indicators, nearly 90 per cent disaggregate them by sex. The individual indicator least likely to be collected concerns mobile phone use, which was collected by only 30 per cent of the countries that collected ICT-use indicators. It is only in Europe that the large majority of countries report ICT-use indicators disaggregated by sex (table 3).

The data collection gap on individual-use indicators implies an overall paucity of internationally comparable, quality data on gender and ICT for informing policy and long-term planning, particularly for low-income countries.

Household composition

This has been added recently as a classificatory variable in the household information. The purpose of disaggregating by sex is to determine whether female-headed households are disadvantaged in comparison with other types of households in terms of ICT access and usage. The ITU has already moved in this direction with its proposal to the IAEG-GS to add *"by sex of household head"* to the indicators on proportion of households with radio, TV and Internet.

TABLE 3. COUNTRIES REPORTING TO ITU ON THE CORE ICT ACCESS AND USE INDICATORS, 2009–2011

REGION (1)	TOTAL NO. OF COUNTRIES	NO. OF COUNTRIES REPORTING ICT-USE INDICATORS	PROPORTION OF COUNTRIES REPORTING ICT-USE INDICATORS (%)	NO. OF COUNTRIES REPORTING ICT-USE INDICATORS DISAGGREGATED BY SEX
Africa	44	2	4.5	2
Arab States	21	4	19.0	4
Asia and the Pacific	40	11	27.5	10
CIS	12	5	41.7	4
The Americas	35	14	40.0	13
Europe	43	36	83.7	36
Total	195	72	36.9	69

Source: ITU.
Note: This table uses the ITU definition of regions (see: www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx).

The United Nations report, *The World's Women 2010,* identifies the collection of statistics and indicators on female-headed households as an important contribution to initiatives aimed at poverty alleviation and the attainment of the MDGs.[71] Statistical evidence of disparities between female-headed households and other households could lead to policies and programmes that facilitate female-headed households' access to ICTs and promote their access and usage by girl children. This addition could bring interesting results to HH16 concerning household expenditures on ICTs, enumerating possible differences between households headed by women and those not headed by women, and also to HH11 concerning type of Internet access, including exploring possible differences in access to broadband.

One of the methodological difficulties would be in identifying female-headed households, especially where a male adult was present. It would be important for enumerators to avoid gender bias by assuming that no female can be head of a household if an adult male is present. Demographic changes, particularly in the economic roles of women, have meant that this is not necessarily the case.[72]

A second difficulty is that of defining the list of categories of household composition. The traditional notion of the existence of a head of household assumes that most households consist of a family, and that one person has primary authority and responsibility for household affairs and its financial support. However, this is no longer the case in many countries. There are multiple forms of households that were not common in the past, such as same-sex households, with or without children, child-headed households,[73] jointly headed households and households of unrelated individuals, among others. It is often very difficult to get respondents in household surveys to designate a household head according to objective criteria, or even to find objective criteria that could be used in a definition. In the absence of clear criteria, the household reference person in household surveys and censuses is often used for family coding purposes, but this can be arbitrary. More research is needed to determine country practices for the purpose of identifying household heads, or the equivalent, in categories of household composition before this variable can be finalized.

The concept of household composition would need to be clarified, but would include female-headed households as one of the categories of households. This variable would allow a gendered comparison for purposes of identifying any disadvantages to female-households in terms of their ICT access and use. A further point of controversy is whether, in contrast to the accepted orthodoxy on the subject, female-headed households as a whole are more likely to be disadvantaged than male-headed households.[74]

C.2. Additions and changes to indicators of household/individual use

Proposed additional indicators:

C.2.1. Proportion of individuals using a mobile phone by type of activity

C.2.2. Proportion of individuals who own a mobile phone

C.2.3. Proportion of individuals not using the Internet, by type of barrier

C.2.1. Proportion of individuals using a mobile phone by type of activity

An indicator of how men and women use their phones respectively is important in itself as well as for an analysis of the gender-related variations in their use. This indicator will illustrate the range of their activities on mobile phones as well as the limitations thereto. It will also indicate differentials between men and women in skills relating to mobile phones. This is particularly important for developing countries where the mobile phone is the dominant ICT, and where a much higher proportion of women use mobile phones than computers. The indicator will need to consider both Internet-enabled phones and other kinds. A sub-indicator of activities by those using unconnected phones, disaggregated by sex, would also be interesting for an analysis of gender differentials.

The questions and responses will need to be defined. They should address educational activities, including learning the use of mobile phones. Given the global proliferation of mobile phones, it is difficult to define a comprehensive list of activities, which vary greatly from country to country and by such factors as age, gender, geographical location, income level and education. Since the core indicators concentrate on economic and social development, it is important to include development-directed categories. Following Nobel laureate Amartya Sen's argument that development is freedom, a variety of leisure activities as well as more purposeful ones should be included.[75]

Possible responses with gender issues:

- Sending or receiving text messages
- Undertaking financial or banking transactions
- Making voice calls or SMS for business purposes
- Accessing social media
- Downloading mobile applications
- Accessing videos
- Taking photographs
- Sending photographs
- Leisure activities

Getting information:

- About goods or services
- Related to health or health services
- From government organizations

Examples of the gender issues indicated by the responses include:

> If women's use of mobile phones were limited only to sending or receiving text messages, this might be related to a low level of skills, but would generally also require literacy in an internationally used language.
>
> If women's use were limited to voice calls only, this would indicate a low level of functionality.
>
> Some of the other activities, such as undertaking financial transactions, downloading mobile applications and sending photographs, would indicate a higher level of skills

Many studies of ICTs have looked at gender differentials in usage, with women credited with their more purposeful use (e.g. obtaining information for family well-being, using the phone for business purposes), while men used them more for leisure. Comparisons of gender differentials on these responses would provide data to test these assumptions. Use of social media might indicate girls' and women's attempts to bypass the cultural and mobility isolation from which they may suffer. It would also lead to comparisons of male versus female use of this medium.

C.2.2. Proportion of individuals who own a mobile phone

The question addressed to the individual would be whether or not he/she presently owned a mobile phone. The definition of a mobile phone owner would have to be worked out, with consideration of whether it was dependent on ownership of a handset and a subscriber identity module (SIM), whether shared ownership could be included and whether it could include SIM card owners who do not own their handsets. The period of ownership would also need to be defined (e.g. over the last 12 months).

Also to be considered is whether a phone supplied by an employer constitutes ownership. It may be difficult to arrive at a consensus on the definition of phone ownership as this may vary from country to country. If a strict definition is adopted, this may lead to undercounting of individuals in developing countries. An alternative method to using a single definition of mobile phone ownership would be to divide the question into various categories of ownership, as described below.

What constitutes ownership, and how to measure it

The question of mobile phone ownership is a difficult one. In Europe and North America, the most common mobile phone ownership pattern is a single subscriber with one subscription on a single handset. Elsewhere, patterns of ownership are more heterogeneous. An individual may own a SIM card that they use in a handset owned by someone else. In developing countries it is more common to own SIM cards (which often retail for as little as $1 or are sometimes distributed free of charge in promotional offers) than handsets. In Africa, many individuals regard themselves as mobile phone owners if they own a SIM card. Possessing a SIM card gives them an address that makes them reachable (if only through messages and voice mail) and enables them to open a bank account, thus facilitating financial transactions and credit to make a call on any borrowed mobile phone device. In Kenya, a fifth of the population owns a SIM card, but not a mobile phone. By adding owners of a SIM card but no handset to those who own a phone, Kenya's mobile ownership penetration rate becomes 80 per cent.[76] In Asia, however, the use of SIM cards to confer mobile phone ownership status is disappearing, as cheap Chinese handsets have become available, for as little as $10 in Sri Lanka, for example. Data are needed to show gender differentials in the ownership of SIM cards without handsets and how this evolves over time.

Some analysts have suggested using SIM card registrations as a way to obtain sex-disaggregated data on mobile phone owners.[77] Using this approach, one possible definition of a mobile phone owner could be: a person who owns a handset and one or more active SIM card(s), or simply owns one or more active SIM card(s). The biggest problem with using SIM card registrations, which are required in most African

countries and which generally register the sex of the registrant, is that they do not identify unique users. In Africa, Asia and Latin America, many people own multiple SIM cards. Estimates of mobile penetration rates based on SIM card registration can erroneously double the number of unique owners.[78] In Kenya, 15.2 per cent of the population surveyed at the base of the pyramid had two active SIM cards, while in India 71 million subscribers in 2012 used multiple SIM cards.[79] The world average is 1.85 SIM cards per individual while in developed countries, 80 per cent are single subscribers to networks.[80]

The following are some reasons for having multiple SIM cards:

- To take advantage of free or reduced intra-network calls or free or reduced costs from introductory cards
- Lack of network connections in some areas
- Functional advantages of using a specific phone and its related SIM card
- Status symbols
- Possession of mobile phones allowing dual or triple simultaneous SIM use[81]

A further gender-related problem with using SIM card registration for ownership is that men often purchase the card in their names and give them to women. For both these reasons, SIM card registration would not work as an accurate indicator of mobile phone ownership by sex.

The most feasible method to collect data on individual mobile phone ownership by sex is through the household/individual-use survey. A number of recent private surveys of mobile phone owners in Africa and other developing areas have produced large samples of sex-disaggregated data.[82] Most of the surveys only asked individuals whether they owned a mobile phone, while others also asked whether the individual owned a SIM card but not a handset. Some simply used global subscriber data from websites such as www.census.gov. A large-scale Blair Foundation/GSMA study defined a mobile phone owner as a subscriber to mobile services. This would imply that a SIM-card owner would qualify as an owner, but this was not specified.[83]

Demand for gender-related mobile phone data

The heaviest demand for gender-related data concerns mobile phone usage at the household and individual levels. This is indisputably the most discussed area of gender and ICT for development, along with access to and use of the Internet. It includes mobile phone activities, ownership of mobile devices (a particularly gender-sensitive area) and barriers to Internet use (for those with Internet-enabled phones). While there is a core mobile phone indicator (HH10 -- those who use a mobile phone), there is no comparable indicator to HH9 (that delineates Internet activities by individuals) with regard to mobile phone activities. This is an especially important area for developing countries where most mobile phones are not Internet-connected, as well as for mobile phone users in developed countries who choose phones that are not Internet-connected. The possible disadvantages associated with lower usage of mobile phones by female-headed households are also of concern. Thus better data pertaining to this issue are required.

Mobile phones as a gender issue

Gender-related core indicators related to mobile phones are essential because these are the predominant ICT globally – far more numerous than computers. Mobile cellular penetration rates in developing countries far surpass those of the Internet. In Africa, for example, while only 16 per cent of the population has access to the Internet, the mobile penetration rate is 63 per cent. In the rest of the developing world the penetration rates are 89 per cent for mobile phones and 31 per cent for the Internet.[84] Women use more mobile phones than the Internet or computers in general. Indeed, in some instances, women using mobile phones constitute the majority of users. In Cameroon, Mozambique and South Africa, for example, more women than men own mobile phones, though gender differentials are small in Côte d'Ivoire, Ethiopia and Rwanda, and statistically insignificant in Botswana and Namibia.[85] Internet access in general, and especially mobile broadband Internet access, remains low among both men and women in developing countries compared with that of narrowband mobile phones, but it is lower among women.[86]

The core indicator HH9 details Internet activities of individuals in depth, but not mobile phone activities, whether using Internet or non-Internet applications. While smartphone users may be accessing the Internet on their phones, few women in developing countries have smartphones or use other means of accessing the Internet on their mobile cellular phones. They are

also less likely than men to have computer access to the Internet, and, for those who have no knowledge of an international language, the mobile phone is the most accessible ICT.

The importance of mobile learning is becoming an increasingly important medium for girls and young women in developing countries – particularly as many of them have limited education and mobility – at times because of pregnancy and childbirth that leads to multiple difficulties in returning to school. Many new applications are being developed to make education available to those who are unable to go to school. UNESCO and the ITU are encouraging gender and mobile learning.[87]

The following are some of the reasons why mobile phones are the most important ICT for the majority of women in developing countries:

- Lower initial capital costs than those of computers
- Less steep learning curve than that of computers
- Can be used regardless of literacy levels
- Available while working in the fields or when away from home or office
- Serve as aids to safety and security
- Enable greater freedom and mobility

Research from Africa has shown that even low-income women are willing to pay a substantial portion of their income to acquire a mobile phone, if they do not already have one.[88] Other research in developing countries shows that the use of mobile phones brings numerous benefits for women and children. For example, use of mobile phones leads to: employment for more women than men, increases in household earnings resulting in better health, nutrition and education outcomes for children, higher earnings from marketing of agricultural produce as a result of mobile-accessed information on market prices and ability to contact suppliers and customers, increased economic opportunities from mobile-phone-related micro-businesses (e.g. phone access, rentals, recharging and operating information kiosks), ability to carry out business activities while engaged in domestic activities, the possibility to circumvent gender-based social conventions that restrict women's mobility and contacts with men, and increased well-being from access to health information and providers. In addition, mobile phones provide an address and enable access to banking facilities for women who previously lacked them.[89]

Why measure mobile phone ownership

While the importance of using mobile phones is recognized in core indicator HH10 on mobile phone usage, for many girls and women, particularly in developing countries, ownership of a mobile phone is preferable to simply having access to one through sharing or borrowing. The latter often entails a relationship of dependence and obligations that may be uncomfortable for women, whereas owning a phone allows privacy, convenience and greater security. Other benefits of ownership include acquisition of a unique address through the phone number, which could substitute for an office, a bank account, and/or a means for obtaining micro-insurance. It can also help increase economic and professional opportunities, especially for entrepreneurs or the self-employed. While shared phones can frequently involve pressures on girls and women, unfortunately this can also occur with ownership when women need to ask men for assistance in purchasing airtime for their phones. On balance, however, it appears that mobile phone ownership offers greater possibilities of privacy and autonomy than shared usage.

In early twentieth century England, Virginia Woolf held out for "a room of one's own" as the standard of women's autonomy. In the twenty-first century, the aspiration for a room would most likely be replaced by a mobile phone of one's own. In view of the cultural difficulties women face if they use mobile phones without owning them, mobile phone ownership can advance gender equality.

Using but not owning a mobile phone generally implies sharing the use of the phone of another individual, or a phone that is available for use by the general public (as in the Grameen Village Phone programme).[90] However, recent research from Africa indicates that it may not always be possible to share. A survey of mobile phone owners in Kenya indicated that only one quarter shared their phone with someone else, and when it was shared, it was usually with a spouse. In South Africa, nearly four fifths of mobile phone owners at the base of the pyramid said they did not share their phone with anyone.[91] When there is sharing, it is nearly always between male owners and female recipients.[92] Among both men and women, phone sharing tends to be more common in poor and rural areas, and varies in prevalence from country to country.

Another recent study from Kenya showed that mobile phone sharing correlated with a scarcity of phones;

as the percentage of mobile phone owners increased, instances of sharing decreased.[93]

The presence of a mobile phone in the household is no assurance that female household members will have access to it. The June 2013 revisions to the core ICT household indicators stipulate that those indicators should refer to household ICT devices that are "available for use by any member of the household at any time." While this is reassuring, operationally it is very hard to ascertain, as cultural gender bias is difficult to establish in an interview. Householders are unlikely to say that boys and men in the house are given preference in accessing ICT, or that socio-cultural differences, such as greater workloads for females, constrain girls and women from having equal access to ICT. This pattern undoubtedly holds true for mobile phone access, particularly when cost-per-use is involved.

C.2.3. Proportion of individuals not using the Internet, by type of barrier

Gender issues in Internet use are best determined by addressing the question both to individuals in the household and to the household as a whole in order to obtain responses that might vary by the sex of the individual respondent. Eurostat addresses barriers to Internet use at the individual level, and the OECD has recommended this approach to developing countries.[94] The HH14 questions on barriers to household Internet access addressed to individuals might elicit different responses by sex, for example on "privacy or security concerns" and "cultural reasons (e.g. exposure to harmful content)". The varying responses by sex could help identify important gender concerns. The current household-level response about lack of confidence and knowledge or skills to use the Internet would also be of interest to gender analysts at the individual level, given the body of research that shows that girls and women generally have low self-esteem and underestimate their computer skills.[95] This new indicator at the individual level could open the possibility for considering such areas as parents' or partners' attitudes towards girls and women using the Internet.

The question and response categories will need to be defined. The questions should include many of the issues that have been discussed as barriers to female access to the Internet, including awareness of the Internet, literacy and educational level, international language skills, digital skills, time, cost, geographical location (e.g. urban vs. rural), and social and cultural norms and skills.

One methodological difficulty is that girls and women in the household might not talk freely with the enumerator, or they might not be allowed to speak without the presence of male members of the household.

Barriers to girls' and women's use of the Internet

The household surveys already address this issue at the household level. However, given the different barriers to Internet use confronting males and females, it is important to look at them at the individual level, disaggregated by sex.

This is a topic that has been discussed at length in the literature on gender and ICT. The barriers encountered by girls and women in developing countries have been identified as relating to literacy, education, language, time, cost, geographical location (e.g. urban vs. rural), and social and cultural norms and skills.[96] Another important aspect is the attitudes of society and women towards information technology, notably the commonly adopted gendered attitude that anything to do with computers is a male domain, and the prevalence of technophobia among females.[97] Eurostat's questions on individual barriers to Internet use include two response items that frequently appear as gender issues in Internet access: the lesser likelihood of women knowing the international languages most commonly used on the Internet, and women's lack of time for accessing the Internet.[98] On both these issues there are clear gender-related differentials in developing countries.[99]

C.3. Possible household/individual indicators for future consideration

C.3.1. Broadband

At its meeting in Mexico City in 2013 the United Nations Broadband Commission adopted as one of its five targets gender equality in broadband by 2020. However, it did not identify any indicators related to this target in its subsequent report, *Doubling Digital Opportunities*.[100]

While both Eurostat and the OECD collect indicators on individual access to broadband in their member States, it would be very difficult to collect this indicator in developing countries. Despite the desirability of

having an indicator to measure progress towards the attainment of the Broadband Commission target, the most appropriate indicator – users of broadband Internet connections, by sex – is not a feasible one to collect, either from administrative data or through household surveys in developing countries. Service providers could provide information on types of services offered to subscribers, but this would be only at the subscriber level, which would include entire households and offices, and not necessarily individuals. In household surveys to date, it has been found that many respondents generally do not know the type or speed of the connection they have. People use the Internet in many different places, from different and multiple devices, and with different speeds, often without knowing the specific speed/type of connection they have.

In 2013, following discussions in the ITU-D Expert Group on ICT Household Indicators Online Forum, which examined the question of broadband use and access at the household level, there was a consensus that this question would be very difficult to implement at the individual level because individuals would find it difficult to distinguish between narrowband and broadband. Given the difficulties in collecting data for this indicator, particularly in developing countries, this indicator is not recommended for inclusion in the core list at this time. However, the measurement of broadband use and access by households, by gender, could be partially covered by indicator HH11 with the addition of the sex of the household head as a classificatory variable.

C.3.2. Gender-based violence

New indicators considered for future development by the 2013 meeting of the ITU Expert Group on Household Indicators on children and youth online protection (CYOP) and on Internet security and privacy could include gender issues, including cyberbullying of girls, exposure and victimization of girls and women through pornography, sexual solicitation, and trafficking of girls and women.[101] Security and privacy issues might also include references to domestic violence.

Another somewhat related issue of potential interest may be the incidence of cybercrime on women and men. Further work is necessary to develop indicators and statistical methodology for measuring these aspects.

C.4. General methodological considerations in gender statistics

In conclusion of this section on gender-related household and individual indicators of ICT usage, it is useful to review some additional general principles for the collection of gender statistics and indicators that are pertinent to individual and household indicators. The introduction of gender in ICT statistics involves a unique set of challenges considering that girls and boys, and women and men do not necessarily engage in the same activities, or necessarily behave in the same way. Boys and men are generally not subject to the same constraints as girls and women, and they do not necessarily have the same opportunities and needs.

The United Nations *Gender Statistical Manual* recommends that data collection tools involving gender should take into account stereotypes and social and cultural factors that might introduce gender bias into data.[102] For accurate collection of the data, girls and women should be able to talk freely to an interviewer. Are they interviewed without the presence of a male head of the household? Are they at ease in talking to a male interviewer? The ability to randomly select individuals in household surveys can be constrained if it is culturally unacceptable to a male head of household to have his wife or daughter, rather than him, selected for individual questions. In such cases, the OECD recommends making appropriate adjustments so that the results are representative of the population.[103]

Although not specifically referring to gender, the ITU's *Manual for Measuring ICT Access and Use by Individuals and Households* recommends that either all members of the household be interviewed and respond about themselves, or that one individual be randomly selected and respond about herself/himself.

D. EDUCATION AND ICT INDICATORS

D.1. Existing indicators that can be disaggregated by sex

Core indicators on ICT in education

The UIS is responsible for the collection of core indicators on ICT in education.[104] Among these core indicators, there are currently three gender-related ones and the UIS is currently collecting sex-disaggregated data on two of these:

ED6: Proportion of learners who have access to the Internet at school

ED8: Proportion of ICT-qualified teachers in primary and secondary schools

The UIS has refined indicator ED6, using two of its conceptually and methodologically similar indicators to collect the data desired, namely:

- Proportion of pupils enrolled (by sex) in programmes offering Internet-assisted instruction; and
- Proportion of pupils enrolled (by sex) in programmes offering Internet-assisted instruction (with broad-band)

There is very little difference between the language of the Partnership core indicator ED6 and the two alternative indicators collected by the UIS. The UIS determined that these two indicators are preferable to ED6 since they better reflect an emphasis on pupils' access and participation in programmes offering the Internet for pedagogical purposes rather than for non-pedagogical and/or administrative activities. Regarding ED8, the UIS uses nationally adopted standards to identify ICT qualified teachers.

The remaining Partnership core education indicator is:

ED7: Proportion of learners (by sex) enrolled at the post-secondary non-tertiary and tertiary level in ICT-related fields (for ISCED level 4 and levels 5-6)

At present the UIS is not collecting data for ED7 because it is focusing on primary and secondary level education. There is a strong case, however, for the collection of ED7, as the data are much in demand to show the potential for countries to successfully compete in the information society. Moreover, it is of particular interest for gender statistics, given the small numbers of girls and women in these fields. It will also be very useful to be able to compare the number of girls enrolled in ICTs with the number of girls who graduate and are subsequently employed in ICT jobs.

Based on a data scoping survey completed in 2007, only 8 per cent of least developed countries (LDCs) and 11 per cent of all African countries had data on this indicator, with 20 per cent and less reporting from countries in Asia, Latin America and the Caribbean, and Oceania. No region had a majority of countries reporting data. Even among all developed economies, only 40 per cent supplied this data. Therefore much work remains to be done to stimulate the collection and reporting of this data in both developed and developing economies.

Tables 4 and 5 show the availability by geographical region of sex-disaggregated data on the core indicators of ICT in education – ED6 and ED8 – for the countries reporting data to the UIS). Both indicators measure ISCED levels 1-3. However, for both these indicators, several regions submitted no data at all. All of the Arab States, Central Asian and East Asia and Pacific countries reporting (but with only 25, 22 and 15 per cent reporting, respectively) submitted sex-disaggregated data on ED6 (i.e. teachers using Internet-assisted instruction); for ED8 a similar number of countries reported, with only one country less.. Most of those reporting data on both of these indicators disaggregated them by sex. As in other sectors, the outstanding challenge in education remains the collection of data on individual ICT use.

D.2. Additional non-core indicators on ICT in education that can be disaggregated by sex

In addition to the core ICT indicators, the UIS is currently collecting sex-disaggregated data for the following indicators that are contained in the UIS's *Guide to Measuring ICT in Education*:[105]

ED35: Proportion of primary and secondary school teachers trained via ICT-enabled distance education programmes

ED36: Proportion of primary and secondary teachers who teach basic computer skills (or computing)

ED37: Proportion of primary and secondary school teachers who currently teach subjects

TABLE 4. PROPORTION OF LEARNERS ENROLLED IN PROGRAMMES OFFERING INTERNET-ASSISTED INSTRUCTION - ED6[a]

REGION	TOTAL COUNTRIES	NO. OF COUNTRIES REPORTING DATA	NO. OF COUNTRIES REPORTING SEX-DISAGGREGATED DATA
Arab States	20	5	5
Central and Eastern Europe	21	0	0
Central Asia	9	2	2
East Asia and the Pacific	34	5	5
Latin America and the Caribbean	43	21	16
North America and Western Europe	29	0	0
South and West Asia	9	0	0
Sub-Saharan Africa	46	0	0
Total	211	33	28

Source: UIS.

Note: Partnership members differ in their definitions of regions. The regions used here are those defined by UNESCO (see: http://www.unesco.org/new/en/unesco/worldwide/).

[a] Data are collected for the methodologically similar indicator, *Proportion of learners enrolled in programmes offering Internet-assisted instruction*.

TABLE 5. PROPORTION OF ICT QUALIFIED TEACHERS IN PRIMARY AND SECONDARY SCHOOLS - ED8

REGION	TOTAL COUNTRIES	NO. OF COUNTRIES REPORTING DATA	NO. OF COUNTRIES REPORTING SEX-DISAGGREGATED DATA
Arab States	20	5	5
Central and Eastern Europe	21	0	0
Central Asia	9	2	1
East Asia and the Pacific	34	5	5
Latin America and the Caribbean	43	21	11
North America and Western Europe	29	0	0
South and West Asia	9	3	2
Sub-Saharan Africa	46	0	0
Total	211	36	24

Source: UIS.

Note: The regions used here are those defined by UNESCO (see: http://www.unesco.org/new/en/unesco/worldwide/).

using ICT facilities

ED38: Proportion of primary and secondary school teachers trained to teach subjects using ICT facilities

ED45: Proportion of learners enrolled in grades where basic computer skills (or computing) are currently taught (for ISCED levels 1-3)[106]

While not explicit in the *Guide*, additional indicators beyond the core indicators may be used for obtaining sex-disaggregated data. Due to general lack of data and its focus on primary through secondary education, UIS is not collecting any data on the following indicators:

ED41: Proportion of learners entitled to use computer laboratories at school as a pedagogical aid (by gender, and by type of institution for ISCED levels 1-3)

ED46: Proportion of learners (by gender) who graduated in the last academic year in ICT-related fields at the post-secondary non-tertiary and

tertiary level (for ISCED level 4 and levels 5-6)

ED47: Proportion of learners (by gender) enrolled at the tertiary level in ICT-enabled distance education programmes (for ISCED levels 5-6)

ED48: Proportion of learners who successfully completed a basic computer skills (or computing) course at the end of the last academic year (for ISCED levels 1-3)

ED49: Promotion rate of learners in grades receiving ICT-assisted instruction (by gender, type of institution and grade) (for ISCED levels 1-3)

ED50: Promotion rate of learners in grades not receiving ICT-assisted instruction (by gender, type of institution and grade) (for ISCED levels 1-3)

ED51: ICT-assisted instruction performance ratio (by gender, type of institution, and grade) (for ISCED levels 1-3)

ED53: Number of female graduates per 1,000 male graduates in ICT-related fields (for ISCED level 4 and levels 5-6)

Although not currently in the *Guide to Measuring ICT in Education*, the UIS also collects data for the following gender-related education indicators:

- Proportion of students enrolled (by gender) in programmes having access to electricity (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in programmes having access to telephone communication facilities (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in programmes with radio(s) for pedagogical use (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in programmes with television(s) for pedagogical use (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in programmes with computer(s) for pedagogical use (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in programmes with broadband Internet facilities for pedagogical use (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in programmes using open education resources (ISCED levels 1-3)
- Proportion of students enrolled (by gender) in courses offering basic computer skills or computing (ISCED levels 1-3)

D.3. Proposed additional indicators in education

Beyond the three existing core ICT indicators in education, five new indicators are suggested:

D.3.1. Proportion of primary and secondary school teachers trained to teach subjects using ICT facilities (ISCED 1-3) (based on UIS indicator ED38)

D.3.2. Proportion of pupils enrolled in programmes offering computer-assisted instruction (ISCED levels 1-3)[107]

D.3.3. Proportion of pupils enrolled in programmes offering Internet-assisted instruction (ISCED levels 1-3)

D.3.4. Proportion of pupils enrolled in programmes offering courses in basic computer skills or computing (ISCED 1-3)

D.3.5. Proportion of graduates in ICT-related fields at post-secondary non-tertiary and tertiary levels (based on UIS indicator ED46)

Justification for the proposed additional indicators

There is the same justification for the first four proposed indicators. They measure to what extent the next generation is being prepared for entering the information society, identifying countries that are giving learners an early start to acquire ICT skills and benefit from computer- and/or Internet-assisted instruction from primary through advanced secondary levels. These indicators go well beyond the current core indicator that identifies only those learners that have access to the Internet at school. These additional indicators that show the proportion of enrolments in schools and programmes using ICT for learning are fundamental to measuring capacity for building digitally literate citizens able to perform in the "knowledge economy". Using ICTs for learning requires teachers trained to use computers and the Internet not only to teach computer skills but all subjects, including teaching students to use computers and the Internet to study any subject. For the information society to take form, ICT-assisted education needs to begin at primary school level and continue through the secondary level. Such education systems will give countries a major advantage in building their global competitiveness.

Methodological considerations

Many countries – especially the middle-income and

higher income countries – can and already do report data on the first four indicators. LDCs tend to be the most challenged in this regard. The problem is that the indicators measure participation of those enrolled in schools and ignore the gaps in access across the entire population, generally because of higher out-of-school rates of girls. One way to solve this would be to use the same enrolment rates and calculate participation indicators using overall population data as published by the United Nations Population Division (UNPD), which take into account out-of-school children. This would provide even better measurement differentials in boys' and girls' participation in ICT-assisted instruction.

Justification for the proposed additional indicator on graduates in ICT-related fields

There is already a core indicator of *learners* (by sex) *enrolled* in ICT-related fields at the post-secondary non-tertiary and tertiary levels (ED7). In addition to ED7, it would be highly desirable to have an indicator which shows the numbers and relative percentages, by sex, of post-secondary and tertiary-level *graduates* in ICT-related fields. Such an indicator should also highlight the proportion of women in the population with formal training to become ICT professionals.

The number of women graduates in ICT-related fields has been falling, rather than increasing, over the past two decades. This reflects the "leaky pipeline" phenomenon[108] according to which fewer girls and women are found at each successively higher level of education, employment and responsibility in scientific and technical fields, especially those related to ICT. Clearly, the lower levels of enrolment of girls in technical subjects at increasingly higher levels of pre-tertiary education is due to the lower numbers originally enrolled at the lower levels of education. Thus, it is important to know not only the number of females who enrolled in ICT-related fields, but also the number of those who graduated.

It is vital to know how many males and females in ICT-related studies actually graduate in order to follow their progression into the labour force and to higher levels of skills and responsibility. This is particularly important in view of the enormous shortfalls of ICT-qualified personnel, both male and female, in most countries in the world. Statistics on the number of female graduates in ICT-related fields would indicate the numbers that could fill existing job vacancies. If the numbers fall short of expectations, then policy measures could be put in place (from institutional to national levels) to keep more girls and women enrolled in school until graduation in ICT fields.

Additionally, the comparison of education data (both enrolment and graduation rates) on girls/women studying in ICT fields with labour force data on those actually working in those field will also inform policy, especially with regard to the leaky pipeline phenomenon, which shows a significant numbers of female graduates in ICT fields not joining the labour force or joining it and then dropping out.[109]

Methodological considerations

This is an indicator that has been much in demand but is difficult to collect because of the variety of fields and institutions that are sources of data. As with many other indicators, the data may be hard to collect in developing countries. Cross-country classifications may not be entirely comparable, as countries may not have used consistent definitions and classifications of fields of study, or may not have adapted the new classification of fields of study that should be considered ICT-related. Also, as the UIS is concentrating on primary through secondary education, this particular indicator would not be a priority for the UIS. For all five of these indicators, all institutions may not be able to provide accurate student data on the gender of the students.

E. EMPLOYMENT

This section brings together two different measurement aspects of ICT employment: employment in ICT professional and technical occupations (across many sectors), and employment in the ICT sector. Concerning gender-related indicators on ICT employment, one new indicator is proposed along with the revision of an existing core indicator to add disaggregation by sex.

E.1. Employment in ICT occupations

E.1.1. Existing indicators

So far, there are no core indicators for ICT occupational employment, although there is strong demand for such data, especially disaggregated by sex.[110] It is an area of great relevance for policy. Further methodological

work in cooperation with the ILO would make this a valuable addition to the Partnership's work. In view of the continuous growth globally of the ICT industry, the intensive use of ICT in other industries and the importance of ICT skills across myriad occupations, it is important to know the gender distribution of ICT employment and skills in order to assess and take action to promote women's competitiveness in the marketplace and to augment the supply of ICT-skilled workers at all levels.

Despite the importance of this area in general, and for gender statistics in particular, data collection on these indicators is greatly hampered by the lack of a uniform, internationally accepted definition of ICT employment and the structure of the ICT labour market. As a result, the measurement of women's employment in ICT is not easy. This area of employment for women needs to be included in discussions on the statistical definition of ICT employment in general, and calls for an internationally accepted standard definition.

Among the complexities of the definition of ICT employment is the variety of approaches for measuring it, including:

- Employment in ICT occupations
- Employment in the ICT sector (by industry)
- Employment using ICT skills and tools

ICT jobs are found in the ICT industry as well as in virtually every other sector of the economy in most countries today. ICT-trained men and women are employed in ICT-intensive occupations both inside and outside the ICT sector, reflecting the deployment of ICT-enabled innovations across the economy. In addition, many men and women are using ICT skills in the workplace gained through ICT education, even though they may not be working in the ICT sector or in ICT jobs. This report proposes the development of new gender-related indicators in ICT occupations[111] and in the ICT sector. Employment using ICT skills is not covered at this time because of the vastness of such an undertaking: it would require surveying virtually the entire working world on its use of ICT skills and tools.

There is a need for sex-disaggregated indicators on employment both in ICT occupations in various sectors and in the ICT sector. Statistics compiled by the OECD show substantial differences between these two categories in the employment of women, though they vary by country. In developed and emerging economies for which relevant data were available, there was a significantly lower proportion of women than men employed in both the ICT sector and in ICT occupations.[112] In 2010, in these countries women's share of employment in ICT occupations was 18 per cent, while in the ICT sector it was just over 30 per cent. Their share in the ICT sector was particularly high in Estonia and Hungary, at over 40 per cent, while the United States, Bulgaria and Romania led in the proportion of women as ICT specialists, at 25 per cent and over.[113]

E.1.2. Proposed additional indicator: Proportion of employees in ICT occupations, by sex

In response to rapid changes in technology, particularly in professional and technical occupations, a new International Standard Classification of Occupations known as ISCO-08 was adopted in 2007 and made available in the public domain in 2008.[114] ISCO-88, the former standard, was found to be out of date in some areas as a result of developments in technology in professional, technical and clerical work, all of which now require substantial use of computers and telecommunications.

ISCO-08 updated and expanded the categories for ICT in professional and technical occupations (table 6). *ICT professionals* (the sub-category in the major group entitled professionals) comprise the minor groups of software and applications developers and analysts, and database and network professionals. *Technicians and associate professionals (ICT technicians)* are further divided into the minor groups of ICT operations and user support technicians, and telecommunications and broadcasting technicians. The distinction between professionals and technicians/associate professionals is based on education (tertiary-level education being required for the professionals category) and skills. This distinction allows the classification of ICT occupations by high and intermediate levels of ICT skills, which is potentially helpful for identifying gender differentials in the levels of employment and skills of men and women, respectively, who are working in ICT occupations.[115]

ICT occupations are also included in the major category of managers, with ICT managers comprising a minor group under the sub-group of production and specialized service managers. The managers group and the professionals group both require tertiary-level education.

TABLE 6. CATEGORIES OF ICT PROFESSIONAL AND TECHNICAL OCCUPATIONS

MAJOR GROUPS	MAJOR/SUB-MAJOR OCCUPATIONAL GROUPS	MINOR GROUPS	EDUCATION REQUIREMENT	ICT SKILLS REQUIREMENT
Professionals	ICT professionals	Software and applications developers and analysts	Tertiary level	High level
		Database and network professionals	Tertiary level	High level
Technicians and associate professionals	ICT technicians	ICT operations and user support technicians	Tertiary level not required	Intermediate level
		Telecommunication and broadcasting technicians	Tertiary level not required	Intermediate level
Managers	Managers: Production and specialized service managers	ICT managers	Tertiary level required	Not defined

Source: ISCO-08. ILO, International Standard Classification of Occupations: Structure, group definitions and correspondence tables. ISCO-08. Vol. I. Geneva; available at: www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_172572.pdf.

Beyond these changes introduced in ISOC-08, the ILO has attempted to define ICT occupations broadly throughout all the ISCO groups as "all occupations that require skills in the production of ICT goods and services." General acceptance of this definition would go a long way towards permitting the collection of an indicator of women's employment in ICT occupations, in particular to assess the proportion of women at the higher skill and managerial levels.[116] Final agreement is still needed on the specific occupational groups to be included.

According to the ILO, data on employment classified by industry and occupation are available for many countries at a sufficient level of detail to allow the production of statistics on ICT employment, although the ILO does not habitually collect such information. In a growing number of countries, these data are disaggregated by sex. Data from European OECD countries and the United States from 2010 showed that women in ICT occupations tended to be the most prevalent) in education and health, followed by finance and insurance, and public administration. Although a higher percentage of American ICT specialists (over 30 per cent of both males and females) work in professional and business services, in Europe there are more women than men working in this generally well-paid area.[117]

The ILO already publishes data on employment disaggregated by sex for the category of ICT professionals in its ILOSTAT database. This indicator should be added to the Partnership core indicators, including the professionals, technicians/associate professionals and managers categories.

Data should be disaggregated by sex and by occupational levels (managers, professionals, associate professionals and technicians). Possible data sources include labour force surveys, official estimates and censuses, and national statistical offices' publications and websites. The major statistical issue is that there is a need to finalize the definition of specific occupational groups to be included.

The critical methodological issue is to achieve agreement on the definition and measurement of ICT employment. Once that is sorted out, the gender breakdown would not normally be difficult for labour data sourced from households.

E.2. ICT employment

E.2.2. Revision of existing core indicator ICT1: Proportion of total business sector workforce involved in the ICT sector, by sex

In response to the growing demand for employment data relating to ICT, ISIC Rev. 4 now identifies the ICT sector as an "alternative aggregation" that member States could use in statistical data collection. The ICT sector is defined as that part of economic activity that is generated by the production of ICT goods and services. It is grouped into ICT manufacturing, trade and service industries, and telecommunications, computer

programming, data processing and computer and communications equipment repair. In addition, software publishing, computer programming, data processing and web portals have been added to the sector's definition.[118] Compliance by member States with this classification of the ICT sector, disaggregated by sex, would provide a clearer indication of women's share of employment in this sector.

The ILO recognizes the significance of disaggregation by sex of the indicator category "employment by sector", of which the ICT sector is a part. As stated by the ILO, it "allows for analysis of gender segregation of employment by specific sector. Are men and women equally distributed in certain sectors, or is there a concentration of females among the services sector?".[119]

As the ICT sector is a major driver of the economy in many countries, and developing countries seek to promote it in order to gain a competitive advantage, the degree of participation of women in this sector is important to document in order to determine whether a country is fully utilizing its human resources to its best advantage.

ICT1 is a core indicator that UNCTAD has collected since 2004. Data availability remains scarce in developing countries, where it ranks with the lowest availability of any business indicators, although this is improving gradually (table 7).

TABLE 7. ECONOMIES REPORTING OFFICIAL DATA ON CORE INDICATOR ICT1, 2008–2011

ECONOMY	NO. OF ECONOMIES REPORTING
Developed	34
Developing	11
LDC	0

Source: UNCTAD.

Note: ICT1 measures the proportion of the total business sector workforce involved in the ICT sector.

While many countries collect employment data,[120] the level of detail available is not always sufficient for all ISIC Rev.4 industries that are part of the ICT sector definition, though in most developed countries these data are available. ICT1 can be disaggregated by gender of persons employed if the underlying data are obtained from labour force surveys (effectively household surveys). UNCTAD currently collects these data by asking countries to report the number of persons employed in the sector.[121] Collaboration is needed between UNCTAD and the ILO to help developing countries measure employment in the ICT sector disaggregated by sex. Countries will also need to adopt the ICT sector definition of ISIC Rev. 4. Difficulties in comparability of data might emerge if some countries do not include the self-employed and contributing family members in employment figures. These are areas in which women are particularly prominent. In addition, further methodological work on the indicator should consider revising the denominator from total business employment to total employment, which is easier to retrieve in national statistics.

F. BUSINESSES, SMALL-BUSINESS OWNERS AND ICT INDICATORS

Two major gender issues that could be addressed by internationally comparable statistics are the use of ICTs by women working in businesses and ICTs in women's entrepreneurship.

A distinction needs to be made between "business use indicators" and "entrepreneurship". The first category is aimed at measuring the use of ICTs by the business sector in a country. Representativeness of the data is achieved by drawing a stratified random sample from an official registry of all active national businesses. In the second category, indicators are aimed at measuring ICT use by entrepreneurs and/or micro and small businesses (also covers the informal sector) using sampling techniques in which the target population is not known (for example through cluster sampling). In addition to representativeness and sampling, the two related but distinct areas of measurement may differ in terms of questions asked and policy issues monitored. Ideally, data for the first category of indicators should be collected through enterprise surveys. Data for the second category would need to be collected through surveys of business owners or entrepreneurs. It is acknowledged that entrepreneurs and small-business owners are conceptually distinct. However, in this section, for reasons related to the feasibility of data collection, small-business owners are considered as a proxy for entrepreneurship. This approximation also takes into account the predominance of small-business owners in developing countries in the context of ICT and women's empowerment.

F.1. Business surveys

F.1.1. The need for gender-related ICT in business indicators

It is important to know how men and women in the workforce differ in their access to and use of ICTs. Are women workers as likely as men to use the Internet for their work? Do both women and men use it to its full potential? Are there differences in workforces composed primarily of men or primarily of women in terms of their access to and use of computers? Are women as likely as men to exploit the capacities of the technology to further their productivity for the success of the enterprise? Gender-related business-use ICT indicators can produce data that would answer these and other related questions.

The work of UNCTAD on measuring the information economy focuses on how businesses and their employees access and use ICTs.[122] Its data collection efforts in this area face the usual difficulty in collecting ICT statistics from developing countries, although in the past decade the number of such economies, as well as transition economies, collecting such data has increased.

In the latest reference period, 2008–2011, 22 developing economies, two LDCs and 8 transition economies reported data on the proportion of businesses using computers (B1). The largest percentage of responses from developing countries was on indicator B3 – proportion of businesses using the Internet, whereas the lowest was on B9 – the proportion of businesses using the Internet by type of access. The response rate from LDCs was very low for all the business indicators, with Africa being the region with by far the lowest response rate (table 8).

At present, there are no sex-disaggregated indicators among the 12 core indicators on ICT use in business. The basic question to be addressed is whether there are gender differentials in the way companies with male and female-dominant workforces, respectively, use ICTs. In the next section, it is proposed to include a filter question relating to the gender composition of the workforce to address this question.

F.1.2. Revision of existing indicators: Measuring business ICT use, by gender composition of the workforce

A filter question could be added to the basic information section in the UNCTAD enterprise survey of ICT use. Enterprise respondents could be asked not only to report on their total number of employees, but also to give a breakdown on the number of men and women in the workforce, thus enabling a disaggregation by sex of employees.[123] This data should be readily available to NSOs.[124] Businesses could then be categorized by varying levels of women's participation (e.g. majority women, majority men, gender-balanced). This would also enable a comparison of ICT usage in companies having employees of both genders, and an examination of all existing business ICT indicators not only by enterprise size, industry and location (urban/rural), but also by gender composition of the workforce.

In terms of feasibility of measurement, it should be relatively easy to obtain nationally representative data on the use of ICT by enterprises that have a majority of women/men workers in a given economy. This information would complement data obtained on informal or semi-informal women entrepreneurs. Both categories of women workers form part of a country's potential to develop.

Such complementary data could permit an analysis of, for example, whether male-dominated enterprises tend to use the Internet more for interacting with the government or for making online payments than female-dominated ones. Another question could be if, within a given industry, female-dominated enterprises are more likely to have a website than male-dominated ones. Whether female-dominated workforces have less access to computer and the Internet and whether they use the Internet in different ways could also be examined.

F.2. Surveys of small-business owners

F.2.1. Why gender-related ICT indicators on entrepreneurship are needed

The development community has evinced considerable interest in ICTs and women's entrepreneurship, particularly in developing countries.[125] They are increasingly seen as a powerful catalyst for women's entrepreneurship, particularly in micro and small enterprises as well as in medium-sized enterprises. This area has become a priority for a number of development agencies, including the World Bank, USAID and the United Kingdom's Department for International Development (DFID). It is also a major area of interest among foundations, such as the

TABLE 8. REGIONS/ECONOMIES REPORTING OFFICIAL DATA FOR CORE INDICATORS ON ICT USE IN BUSINESS, B1 TO B12, 2008–2011

REGION	NO. OF ECONOMIES	NO. OF ECONOMIES REPORTING B1	NO. OF ECONOMIES REPORTING B2	NO. OF ECONOMIES REPORTING B3	NO. OF ECONOMIES REPORTING B4	NO. OF ECONOMIES REPORTING B5	NO. OF ECONOMIES REPORTING B6	NO. OF ECONOMIES REPORTING B7	NO. OF ECONOMIES REPORTING B8	NO. OF ECONOMIES REPORTING B9	NO. OF ECONOMIES REPORTING B10	NO. OF ECONOMIES REPORTING B11	NO. OF ECONOMIES REPORTING B12
Africa	58	6	5	6	5	5	5	5	5	1	3	3	4
America	49	5	5	7	4	6	5	5	5	2	5	5	6
Asia	50	16	13	17	11	16	15	16	15	6	15	14	15
Europe	45	35	34	34	33	35	33	31	32	31	34	33	34
Oceania	23	2	2	2	2	2	2	2	2	0	2	2	2

ECONOMY	NO. OF ECONOMIES REPORTING B1	NO. OF ECONOMIES REPORTING B2	NO. OF ECONOMIES REPORTING B3	NO. OF ECONOMIES REPORTING B4	NO. OF ECONOMIES REPORTING B5	NO. OF ECONOMIES REPORTING B6	NO. OF ECONOMIES REPORTING B7	NO. OF ECONOMIES REPORTING B8	NO. OF ECONOMIES REPORTING B9	NO. OF ECONOMIES REPORTING B10	NO. OF ECONOMIES REPORTING B11	NO. OF ECONOMIES REPORTING B12
Developed	32	31	33	31	33	32	31	32	29	32	33	32
Developing	22	19	24	17	21	21	22	21	6	19	18	20
LDC	2	1	2	1	2	1	1	1	0	1	1	2
Transition	8	8	7	6	8	6	5	5	5	7	5	7

Source: UNCTADStat.

Note: This table is based on the UNCTAD classification of countries and territories; available at: http://apps.unctad.unctad.org/en/Intrastat----UNCTADs-statistical-resource-center/Classifications/Country-and-region/.

Cherie Blair Foundation for Women, whose objective is to support women's entrepreneurship in developing countries, particularly by helping them to increase their business skills, technology, networks and access to finance.[126]

> UNCTAD emphasizes the importance of ICT to promote women's entrepreneurship, as follows:
>
> The evolving ICT landscape is offering women entrepreneurs new opportunities to strengthen their businesses and become more effective. Through mobile phones, electronic platforms and networks, radio, TV, blogs and the Internet, women entrepreneurs are reaching out to customers and building their businesses in ways they could not do before. Effective use of ICTs is now helping to overcome several challenges that women entrepreneurs in developed and developing countries face.
>
> At the same time, there is evidence of a "gender digital divide" wherein women entrepreneurs due to lack of literacy, skills, access, resources and other factors are excluded from the opportunities and benefits offered by ICTs.
>
> UNCTAD is mandated to promote more effective application of ICTs for enterprise development, including women's entrepreneurship, in developing countries.[127]

A recent study prepared for UNCTAD recommended the use of ICTs as one of the three major catalysts for accelerating women's entrepreneurship.[128]

A country grows by the production and employment generated by its businesses, no matter what the gender of the business owner. Women's businesses that do not use or that underutilize ICTs represent untapped potential for enterprise success and economic growth. UNCTAD describes succinctly the benefits that ICTs can bring to businesses:

> ICT use can lower transaction costs, help firms obtain information about new market opportunities, improve their communication along the value chain, and broaden the ways in which products and services are provided to the customer. Private firms invest in ICTs to become more productive and more competitive.[129]

If women-owned businesses are less up-to-date and less efficient as a result of less than optimal ICT use, the country's overall development suffers. The success of women-owned businesses has implications that are greater than higher profit, production and employment; it tends to translate into gains for the family as well, providing role models for girls, education for the children and improved well-being of the family as a whole. ICT-based support can also help to overcome barriers and constraints that are unique to women entrepreneurs, notably, greater difficulties of access to finance than men, time constraints due to family and domestic responsibilities, restricted physical mobility, cultural restrictions on meeting unrelated men, and limited skills and training.[130]

For all these reasons, data are needed to identify any male-female differentials on the part of entrepreneurs in adopting and using ICTs. While, conceptually, there is a distinction between entrepreneurs[131] and small-business owners, the following section refers only to the latter. This choice facilitates data collection efforts in a very incipient measurement area, as it is generally more difficult to identify entrepreneurs than owners of small businesses. Another possible approach to be considered would be to integrate questions on ICT use in more general entrepreneurship surveys.

F.2.2. ICTs and women owners of small- businesses

In considering indicators of gender differentials in the adoption of ICTs by business owners, the basic question is: How do male- and female-owned micro and small enterprises use ICT? This requires data on the following questions:

- What is the proportion of women-owned businesses that are using ICT, at what level, and for what purposes?
- Are the businesses using the Internet?
- Are they using it mainly to send e-mails and for obtaining information, or for engaging in e-business and/or e-commerce?
- How does the proportion of women-owned businesses using ICT, for various purposes, compare with that of male-owned businesses?

The issue of differentials between male and female business owners in the degree of use and exploitation of the Internet for business purposes has implications for policy. One study from Africa found that women's use of ICTs decreases as technologies and services become more sophisticated.[132] Another recent study of small businesses in the United Kingdom showed that women entrepreneurs were more likely than men

to use technological innovations in their products and services.[133] Large-scale, comparable data collection across countries is needed to determine if either of these findings can be generalized. Once reliably documented, the results may then be used to recommend policy and actions for the benefit of the entire society. This is important because enterprises can profit from doing more with ICTs than sending and receiving e-mails or looking for information on the Internet. Both male- and female-owned enterprises in developing and transition economies can advance by adopting applications such as e-business, including business-to-government (B2G) and e-commerce.

The data should be collected by means of surveys of micro- and small- business owners and disaggregated by sex, with questions on the use of ICT. However, data for micro and small enterprises are often difficult to collect and hard to come by, particularly in developing countries, where many such businesses are unregistered. If it were possible to collect such data, it would help to identify the viability and competitiveness of women's micro and small enterprises so that measures could be taken to encourage their adoption and upgrading of ICTs where needed.

An example of this methodological approach is a survey of ICT use by women entrepreneurs in Malaysia.[134] Pending the analysis of comparability, data could also be gathered from informal sector sources in a number of countries. For example, data on small-business owners are available from the following surveys in the United States and the United Kingdom, but they do not yet include ICT-related questions:

- United States: Survey of Business Owners by the US Census Bureau[135]
- United Kingdom: several sources, including Small Business Survey (Department for Business Innovation and Skills);[136] and Women's Entrepreneurship Facts and Statistics from Prowess (the former National Association for the Promotion of Women's Enterprise).[137]

A number of relevant surveys, some of which focus on business owners, are also conducted in developing countries, but their approaches and methodologies tend to vary greatly.[138] The World Bank extracts data from its Micro-Small and Medium Enterprises (MSME) Surveys and publishes sex-disaggregated indicators, including on firms with female participation in ownership, even though these data are not nationally representative. The size definitions of enterprises in these surveys also differ from those used by UNCTAD and are not based on official statistics, but rather on data collection by a consultancy firm.[139] The ILO, RIA and LIRNEasia are also involved in identifying and/or collecting ICT indicators and data on micro and small enterprises.

Further development work is needed to consider what would be the best survey vehicle for collecting data on ICT and small-business ownership. A clear definition of concepts and units to be surveyed will also be necessary.[140] The work of the ILO on measuring informal enterprises and operators could lead to the collection of useful data on differentials in male and female use of ICT in the workplace. Its *Manual on Informality* suggests that use and access to mobile phones and the Internet by gender of the entrepreneurs be included as variables and indicators for surveying the characteristics of informal sector business enterprises.[141] An example using this approach is the Colombia survey of the business environment of micro-establishments.[142] Although the ILO manual suggests indicators of Internet and mobile phone use for informal sector enterprises and entrepreneurs, and a number of countries include this variable in their informal survey questionnaires, the indicators are not part of the standard ILO Labour Force Survey and could not be readily included in the ILO's regular data collection from countries.

Experience with sex-disaggregated data collection on ICT use in micro and small enterprises is available from two TGG members. In 2012, the RIA completed nationally representative business surveys in 12 African countries, classifying businesses as informal, semi-formal and formal, largely on the basis of registration (with informal enterprises usually being unregistered, not paying taxes and operating from temporary structures).[143] Businesses were also identified by size of enterprise and form of ownership, with breakdowns on ownership by sex and by level of education. Only businesses with a physical presence were sampled, with sample sizes ranging from 375 to 850.[144] As the vast majority of businesses (90 per cent) fell into the informal or semi-formal category, the RIA excluded formal businesses from its analysis. The indicators provide data on several areas of ICT use, including:

- Having a website
- Employees' use of e-mail for conducting business

- Use of mobile phones and/or social media for advertising
- Use of online banking, e-mails, mobile phones and SMS for communication with suppliers
- Use of online banking and mobile phones for money transfers with customers

LIRNEasia also ran a microentrepreneur survey in 2013 to gauge the use and interactions with service providers of ICTs (including mobile phones), as well as the provision of electricity and government services in urban settings, in Bangladesh, India and Sri Lanka.[145]

F.2.3. Proposed additional indicators on small-business owners and ICT

F.2.3.1. Proportion of small-business owners using the Internet, by sex of owner

F.2.3.2. Proportion of small-business owners using mobile phones, by sex of owner

F.2.3.3. Proportion of small-business owners using mobile phones, by type of activity and by sex of owner

F.2.3.4. Proportion of small business owners using the Internet by type of activity and by sex of owner

For micro and small businesses the most useful ICTs appear to be mobile phones and the Internet. In a study on women's increased opportunities for entrepreneurship through ICT at the micro and small enterprise level in India, researchers found a correlation between the use of mobile phones and the success of women's businesses. Their use of mobile phones helped lift barriers and provided increased opportunities, in addition to having a positive impact on women's empowerment in general and on family well-being.[146] A survey of ICTs in informal businesses in Africa showed that mobile phones were the only ICT widely used; the use of fixed lines, computers and the Internet was negligible.[147] Moreover, there appears to be a gender divide in developing countries in the use of ICTs, even mobile phones, in business. In a recent study of African countries, it was found that a much higher share of male-owned than female-owned informal sector businesses used mobile phones.[148] Microenterprises are less likely to use the Internet (although their number is steadily increasing), though its use is likely to become significant globally in the operation of small businesses, particularly those that deal with international clients and suppliers.

In the proposed indicators, the emphasis would be on the use of ICTs on each of these platforms by purpose of use (i.e. for business processes, such as obtaining information, locating and contacting clients).[149] These choices are not platform-specific given that a non-Internet-enabled mobile phone as well as an Internet-enabled mobile phone or computer could be used for the same purposes. This raises the problem of possible redundancy of questions, but, so far, few women in developing countries own Internet-enabled mobile phones. The RIA's 2013 study found that in 10 of 12 African countries, women were less likely to own Internet-enabled mobile phones than men.[150]

In each case the data would be disaggregated by sex. Sub-indicators could be calculated by size of enterprise. Information on the age and education level of the entrepreneur would also be valuable. As noted, the question concerning Internet use could be redundant for entrepreneurs using Internet-enabled mobile phones. The list of usage activities would be reviewed, but could generally follow UNCTAD indicator M4 for mobile phones and Core ICT indicator B12 for the Internet.[151] Ideally, the activity lists would vary in the level of digital skills required and the variety and sophistication of business purposes. These issues would need to be worked out in an exercise on methodology. The major difficulties are identifying unregistered microenterprises and assuring the undertaking of surveys of micro and small enterprises with ICT modules in developing countries.

G. E-GOVERNMENT

Among the seven e-government core indicators that were added to the Partnership's core list of indicators in 2012, there are two individual-level core e-government indicators that can be disaggregated by sex.[152] These two, which are also WSIS target indicators, are:[153]

EG1 Proportion of persons employed in central government organizations routinely using computers

EG2 Proportion of persons employed in central government organizations routinely using the Internet

The new Partnership core indicators on e-government are supply-side, rather than demand-side, indicators, and therefore do not look at users of e-government services. While it is of interest to know whether more

male than female government employees are routinely using computers and the Internet, and vice-versa, these individual-level indicators do not shed any light on e-government as a service area directed at citizen users; nor do they show the occupation or skill level of the persons employed, which decreases their utility. More relevant and of greater importance, because of its wider impact than the above two indicators, is knowing whether women are accessing government information and services, using computers and the Internet, and whether they are finding the information and services they need to the same extent as men. As noted in the section on household- and individual-use indicators, this aspect of e-governance is addressed in the responses to household- and individual-use indicator HH9, which include using the Internet to obtain information from general government organizations and to interact with those organizations.

Collection and disaggregation of these two indicators would provide information on the ICT skills of men and women working in central government organizations.[154] The comparison of gender differentials might lead to efforts to improve the ICT skills of whichever sex lagged behind the other. For this and other reasons, collection of these two core e-government indicators would increase the number of gender-related core indicators.

CHAPTER IV.
CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The suggested changes comprise revisions to two existing areas of ICT measurement (employment in the ICT sector and business access indicators) and 13 additional indicators, of which 10 need further development work. In addition, this report has identified three existing Partnership core indicators, allowing for sex-disaggregated reporting (on education and e-government), for which the data are not yet being collected at the international level. The report recommends that data collection on these indicators be started as soon as possible. Two areas are highlighted for consideration in future revisions and indicator development work: gender equality in access to broadband and gender-based violence.

In addition to the suggested changes, the report acknowledges and builds on 20 existing Partnership core indicators that already allow the measuring of gender and ICT.

Table 1 presents a summary of existing Partnership indicators on gender and ICT and suggested revisions and additions.

The basic purpose of this exercise has been to assess current gender-related indicators and identify additional ones in an effort to improve the coverage and availability of internationally comparable, reliable data on gender and ICT. The most important purpose of these data is to create awareness of differential access and use of ICTs by males and females, and to bring this issue to the attention of researchers, planners and policymakers.

If the suggested changes are endorsed and data collected by countries, they can provide considerable information about areas where internationally comparable data do not exist at present. These will help provide answers to questions such as the following:

In education:

- Are women teachers trained to the same extent as men to teach with the help of ICTs?
- Are girls learning computer skills in school?
- Are girls as likely as boys to benefit from computer-assisted learning in school?
- How many girls are graduating in ICT-related fields?

In accessing and using ICTs:

- What are the common barriers to accessing and using the Internet among girls and women?
- Are female-headed households and their members less likely than other types of households to access and use ICTs? At what level are they using them?
- Are women entrepreneurs using mobile phones and the Internet to their advantage in business to the same extent as men?
- To what extent do girls and women own mobile phones?
- For what activities are females using their mobile phones?
- In small businesses, do men and women differ in access to and use of mobile phones?

In employment in the ICT sector and ICT jobs across many sectors:

- Do young women have the necessary credentials for this work?
- What is the gender composition of the workforce using ICTs?
- To what extent are women represented among ICT specialists?
- What is the proportion of women in total employment in the ICT sector?

Collection of data on all these areas would be important steps towards the process of building inclusive information societies. The next section makes recommendations for strengthening the collection of these and other gender-related ICT statistics and indicators.

B. RECOMMENDATIONS

Overall

Improving collection of individual-level ICT data, particularly from developing countries, is key to obtaining gender-related ICT statistics. In the experience of the Partnership, the biggest problem is not that of obtaining data disaggregated by sex, but rather the collection of individual-level ICT data in the first place. Once individual data is scheduled for collection, its disaggregation by sex should not be difficult.

Partnership efforts

Continue to develop international standards and methodologies for ICT indicators

The Partnership and the TGG should continue working with NSOs to establish and revise, as necessary, internationally comparable gender and ICT indicators that can be used by countries in their nationally representative data collection, taking account of previous efforts, manuals and guidelines of the Partnership.

Promote the collection of individual-level data on use of ICTs

Especially in developing countries, the most important activities for the Partnership are its efforts to encourage NSOs and other official statistical entities in developing countries to collect individual-level ICT data, with sex as a classificatory variable.

The advocacy role of the Partnership is crucial for strengthening the capabilities and will to collect ICT indicators at the national level, especially those on individual use. This requires not only a continuation, but also a reinforcement, of training efforts on the part of the partnership members, including the publication of manuals and other guides in support of technical workshops and training courses. Efforts will be needed to secure donor funding to facilitate ICT data collection in developing countries, in addition to funds that may already be available for developing general statistical expertise. Regional economic commissions can help with awareness-raising and dissemination efforts, as well as with capacity-building. It is necessary to continue to coordinate efforts on measuring ICT with the work of agencies responsible for other statistical surveys. This will strengthen outcomes, both in terms of boosting expertise in national statistical systems and more efficient spending of donor funding.

Build awareness of gender-related ICT statistics

The Partnership as a whole and its members individually need to raise awareness among policymakers and data producers of the importance of gender-related ICT statistics, emphasizing the importance of having gender and ICT data for policy-making and implementation. The fact that this can be done without the allocation of additional resources through the collection of individual-level ICT statistics in such a way that they can be easily disaggregated needs to be highlighted.

Interact with the gender statistics community

The Partnership, through the Task Group on Gender, should continue and increase its interactions with the gender statistics community, especially through the IAEG-GS, to foster awareness of the importance of ICT to gender issues. While NSOs are concerned with integrating a gender perspective into national statistics, they should be encouraged to consider integration of an information technology component into those statistics, in view of the global importance of an inclusive information/knowledge society.

Promote data collection on multiple uses of mobile telephones

Special efforts should be made to collect data on individual mobile cellular phone indicators, particularly in developing countries, as they are the most widely available ICT globally, and they are becoming the standard mode of Internet/broadband access in much of the world. In many developing countries, and especially among girls and women, they are the ICT used by most people.

National efforts

Coordinate with ICT policymakers to incorporate gender in data collection

NSOs, in collaboration with policymakers responsible for ICT, should consider integrating a gender perspective into ICT data from the first stage of planning data collection and in setting out the objectives of the survey or census.

Adhere to international standards

While promoting an awareness of gender issues is important, there needs to be an emphasis on the collection of internationally comparable statistics in order to facilitate sound analysis and the development of successful policies and programmes. For this purpose, the use of internationally agreed standards, definitions, guides and manuals is paramount.

What kinds of surveys?

While ICT surveys are most desirable as they allow a large number of questions to be included, the inclusion of individual-level ICT questions in a module in existing NSO surveys, such as a census or labour force survey, is also valuable. Given the costs of national

data collection, adding items to existing instruments is far preferable to undertaking new surveys. This is particularly true for developing countries, where there have been few stand-alone ICT surveys. Future methodological work on internationally comparable gender and ICT indicators needs to explore alternative data sources (e.g. different official surveys and administrative data sources) and identify the optimal choice.

Avoid gender bias

These are general principles for gender statistics that need to be transmitted to supervisors and field personnel collecting data and conducting interviews in order to guarantee that the situation of women and girls is properly reflected in individual-level ICT data. Gender-related measurement issues and gender stereotypes should be addressed and clear explanations given on questions that may involve gender issues. Language should be vetted for gender-related biases or other stereotypes, and care should be taken that any examples given do not reinforce gender stereotypes. Field personnel need to be trained to appreciate the different experiences and situations of men and women, so that, in conducting interviews, they do not incorporate biases that interfere with an accurate determination of the inequalities between men and women.

ANNEX

Revised and extended core list of ICT indicators, 2013

A1 Fixed telephone subscriptions per 100 inhabitants
A2 Mobile cellular telephone subscriptions per 100 inhabitants
A3 Fixed Internet subscriptions per 100 inhabitants
A4 Fixed broadband Internet subscriptions per 100 inhabitants
A5 Mobile broadband subscriptions per 100 inhabitants
A6 International Internet bandwidth per inhabitant (bits/second/inhabitant)
A7 Percentage of the population covered by a mobile cellular telephone network
A8 Fixed broadband Internet access prices
A9 Mobile cellular telephone prepaid prices
A10 Percentage of localities with public Internet access centres (PIACs)
HH1 Proportion of households with a radio
HH2 Proportion of households with a television
HH3 Proportion of households with telephone
HH4 Proportion of households with a computer
HH5 Proportion of individuals using a computer
HH6 Proportion of households with Internet
HH7 Proportion of individuals using the Internet
HH8 Proportion of individuals using the Internet, by location
HH9 Proportion of individuals using the Internet, by type of activity
HH10 Proportion of individuals using a mobile cellular telephone
HH11 Proportion of households with Internet, by type of service
HH12 Proportion of individuals using the Internet, by frequency
HH13 Proportion of households with multichannel television, by type
HH14 Barriers to household Internet access
HH15 Individuals with ICT skills, by type of skills
HH16 Household expenditure on ICT
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
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
ICT1 Proportion of total business sector workforce involved in the ICT sector
ICT2 ICT sector share of gross value added

ICT3 ICT goods imports as a percentage of total imports
ICT4 ICT goods exports as a percentage of total exports
ED1 Proportion of schools with a radio used for educational purposes
ED2 Proportion of schools with a television used for educational purposes
ED3 Proportion of schools with a telephone communication facility
ED4 Learners-to-computer ratio in schools with computer-assisted instruction
ED5 Proportion of schools with Internet access by type of access
ED6 Proportion of learners who have access to the Internet at school
ED7 Proportion of learners enrolled at the post-secondary level in ICT-related fields
ED8 Proportion of ICT-qualified teachers in schools
EG1 Proportion of persons employed in central Government organizations routinely using computers
EG2 Proportion of persons employed in central Government organizations routinely using the Internet
EG3 Proportion of central Government organizations with a local area network (LAN)
EG4 Proportion of central Government organizations with an Intranet
EG5 Proportion of central Government organizations with Internet access, by type of access
EG6 Proportion of central Government organizations with a Web presence
EG7 Selected Internet-based online services available to citizens, by level of sophistication of service

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[41] See: www.lirneasia.net.

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[58] Not to be confused with the Association for Progressive Communication Gender Evaluation Methodology for Internet and ICTs, also known as GEM.

[59] http://www.weforum.org/issues/global-gender-gap.

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[63] This is particularly the case with measuring the impact of ICT on gender. The complexity of ICT impact studies is covered at length in UNCTAD's publication, *Measuring the Impacts of Information and Communication Technology for Development*. Geneva, 2011 (http://unctad.org/en/docs/dtlstict2011d1_en.pdf). Nonetheless, quantitative ICT research can answer *why* questions through responses to barriers to Internet use in household/individual-use surveys.

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[81] InfoDev World Bank. Mobile usage at the base of the pyramid in South Africa. Washington, DC, 2013; available at: http://www.infodev.org/infodev-files/final_south_africa_bop_study_web.pdf. Examples of dual-SIM card phones are the Dual SIM Nokia X1-01 and Nokia C2-00.

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[96] Hafkin NJ and Taggart N. Gender, information technology and developing countries: An analytic study. Washington, DC, United States Agency for International Development (USAID), 2001.

[97] Hafkin NJ. Gender. *Loc. Cit.,* 2012.

[98] EUROSTAT. Variables collected in the household/individuals surveys, 2003–2012. 2013; available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/documents/Tab/Variables%20summary%20HH%202003-2012.pdf.

[99] Hafkin NJ and Taggart N. Gender. In: *Information Technology and Developing Countries: An Analytic Study*. Washington, DC, Learn Link. 2001; Huyer S, Hafkin N, Ertl H and Dryburgh H. Women in the information society. In: Sciadas G, ed. *From the Digital Divide to Digital Opportunities: Measuring Infostates for Development,*. Québec, Claude-Yves Charron: 135–196.

[100] Broadband Commission Working Group on Broadband and Gender. *Doubling Digital Opportunities: Enhancing the Inclusion ofWwomen and Girls in the Information Society*. Geneva and Paris, ITU and UNESCO, 2013; available at: www.broadbandcommission.org/documents/working-groups/bb-doubling-digital-2013.pdf-

[101] ITU, Online Expert Group on Household Indicators; at: http://www.itu.int/en/ITU-D/Statistics/Pages/publications/manual2014.aspx.

[102] United Nations. *Gender Statistical Manual: Integrating a Gender Perspective into Statistics*. New York, 2013; available at: http://unstats.un.org/unsd/genderstatmanual/A-guide-to-the-manual.ashx. Notably, however, the manual makes no reference to ICT statistics in the areas of interest to the Partnership.

[103] OECD. *Guide to Measuring the Information Socie*ty. Paris, 2011.

[104] See UNESCO. *Guide to Measuring Information and Communication Technologies (ICT) in Education*. Montreal, UNESCO Institute for Statistics, 2009.

[105] See: http://unesdoc.unesco.org/images/0018/001865/186547e.pdf

[106] The UIS collects data on enrolment in programmes offering basic computer skills or computing at these primary and secondary levels.

[107] This and the next two indicators, all of which use sex-disaggregated data, are UIS-recognized indicators but do not have an official ED number in UIS's *Guide to Measuring ICT in Education*.

[108] Reference to women and the leaky pipeline may be found in Camp T. The Incredible Shrinking Pipeline, *Communications of the ACM* 1997, 40(10): 103–110.

[109] The Republic of Korea is a case in point, where a relatively large percentage of female students graduate in ICT-related fields, but a much smaller percentage join the workforce (see Young-Ock Kim and You-Kyung Moon2011. National assessment on gender and science, technology and innovation: Republic of Korea; available at: http://wisat.org/data/documents/RepKorea_GE-KS.pdf).

[110] There are frequent articles in newspapers and journals on this topic, such as "A striking absence of women", *New York Times,* 12 October 2013.

[111] An estimated 4 to 5 per cent of total employment in developing countries is in ICT occupations (ILO, ICT Employment Indicators and Gender, Geneva, 2013; available at: http://www.itu.int/en/ITU-D/Statistics/Documents/events/wtis2013/015_E_doc.pdf).

[112] OECD (2012), "ICT Skills and Employment: New Competences and Jobs for a Greener and Smarter Economy", *OECD Digital Economy Papers*, No. 198, OECD Publishing. doi: 10.1787/5k994f3prlr5-en

[113] *Ibid*. 16. The ICT sector in European countries is defined as the sum of ISIC. Rev. 4 sections 26, 61, 62 and 63. The definition of the sector varies in other countries. For ICT specialists, European countries use the sum of ISCO-08 codes 213, 312, 313 and 724.

[114] Although the standard was published only in 2012, it was adopted by many countries before then.

[115] ICT occupations with the lowest skill levels (i.e. ICT installers and servicers) are likely to be male-dominated. Cisco Systems, for example, set up a networking academy training programme to encourage girls and young women to enter the field. Required technical training was limited and no tertiary-level education was needed.

[116] The ILO is also considering a thematic breakdown of ICT occupations that would include a number of other sub-groups that primarily involve the production of ICT goods and services, such as ICT service managers, electronic engineers, ICT sales professionals and IT trainers (Sabadash A, *ICT Employment Statistics in Europe: Measurement Methodology. European Commission*. JRC Technical Report. Luxembourg, 2012; available at: ftp://ftp.jrc.es/pub/EURdoc/JRC76385.pdf).

[117] OECD. ICT skills and employment: New competences and jobs for a greener and smarter economy. *OECD Digital Economy Papers*, No. 198, 2012. OECD Publishing; available at: http://dx.doi.org/10.1787/5k994f3prlr5-en, 16.

[118] The major difference between ISIC Rev. 4 and the previous version with regard to the ICT sector is the removal of the stipulation that products of the ICT sector include those that " …use electronic processing to detect, measure and/or record physical phenomena or to control a physical process." For further information on ISIC Rev. 4, see: http://unstats.un.org/unsd/cr/registry/isic-4.asp.

[119] ILO. KILM 4. Employment by sector, 1. Geneva, 2013; available at: http://kilm.ilo.org/manuscript/kilm04.asp.

[120] Data on the ICT sector collected by the private sector, such as national information technology associations, are not always representative of the national situation as they may be based on member surveys rather than on representative samples as in NSO surveys. Nevertheless, such initiatives should consider collecting and publishing sex-disaggregated data when possible. See, for example, Federal Ministry for Economic Cooperation and Development, Germany. *IT Sector Promotion in Developing and Emerging Countries: Toolbox*. Bonn and Eschborn, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2011, part of the UNCTAD/GIZ/WITSA project on the IT industry barometer, standardizing a global M&E tool for the ICT sector.

[121] Partnership, *Core ICT Indicators*, 2010.

[122] The WSIS also charged UNCTAD with developing indicators to monitor progress in the use of ICTs for development.

[123] In certain countries, business surveys are conducted by interviewing the IT manager, but this person might have difficulties in answering the question concerning composition of the workforce by gender.

[124] RIA has collected information for micro and small businesses by sex of owner (see RIA, Household and Small Business Access and Usage Survey 2011. Brief Survey Methodology. Unpublished paper).

[125] For further information, see, for example, UNCTAD's *Information Economy Report* 2010 and 2011, particularly the 2011 report, Ch. 5, Leveraging ICTs to support women's entrepreneurship; available at: http://unctad.org/en/Docs/ier2010_en.pdf, http://unctad.org/en/PublicationsLibrary/ier2011_en.pdf. Also, LIRNEAsia. Helping BoP microentrepreneurs to do business through mobiles: Innovation brief. 2013; available at: http://Lirneasia.net/projects/icts-the-bottom-of-the-pryamid.

[126] See: http://www.cherieblairfoundation.org/about-us/.

[127] UNCTAD. ICTs and Women's Entrepreneurship. Geneva, 2013; available at: http://unctad.org/en/Pages/DTL/STI_and_ICTs/ICT4D-Women.aspx.

[128] Weeks J. UNCTAD's Research Project on Women Entrepreneurship and Innovation. Geneva, 2012; available at: http://unctad.org/sections/wcmu/docs/ciimem1_4th_Weeks_en.pdf.

[129] UNCTAD. *Information Economy Report 2011*. Geneva, 2011:, Chapter 6.

[130] UNCTAD, *Information Economy Report 2011*. Geneva, 2011, Chapter 5.

[131] See, for example, the OECD/Eurostat Entrepreneurship Indicators Programme and Measurement Framework, at: www.oecd.org/std/business-stats/theentrepreneurshipindicatorsprogrammeeipbackgroundinformation.htm.

[132] It is suggested that higher levels of technology require more education and higher income to access and use it, and women tend to have less of each than men (RIA. Lifting the veil on ICT: Gender Indicators in Africa, 1. Cape Town, 2013).

[133] Prowess 2.0 Women in Business. 2013. Facts, 1; available at: www.prowess.org/uk/facts.

[134] Ndubusi NO and Kahraman C. Malaysian women entrepreneurs: understanding the ICT usage behaviors and drivers, *Journal of Enterprise Information Management*, 2005, 18(6) : 721–739.

[135] www.census.gov/econ/overview/mu0200.html.

[136] www.gov.uk/government/publications/small-business-survey-2012-businesses-led-by-women-and-ethnic-minorities. The Small Business Survey (BIS) uses women-led businesses as their gender category, concentrating on women managers or those having a majority of women in their management team, rather than women owners. In many micro and small enterprises the manager may also be the owner.

[137] www.prowess.org.uk/facts

[138] A list of these surveys can be found in ILO, *Measuring Informality: A Statistical Manual on the Informal Sector and Informal Employment*. Geneva, 2012; available at: www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_182300.pdf. See also: Statistics South Africa. Survey of Employers and the Self-employed, 2009.

[139] See International Finance Corporation. MSME Country Indicators. Washington, DC, 2013; available at: www.ifc.org/wps/wcm/connect/Industry_EXT_Content/IFC_External_Corporate_Site/Industries/Financial+Markets/msme+finance/sme+banking/msme-countryindicators; IFC and World Bank. Enterprise Surveys, Washington, DC, 2013; available at: www.enterprisesurveys.org.

[140] In some developing countries, enterprise survey questionnaires are addressed to IT managers of businesses. Questions on ICT use by business owners would need to be addressed to the business owners themselves, but in larger businesses, they may not be aware of all aspects of ICT use. Therefore it may be difficult to adapt business surveys to capture information on business owners.

[141] ILO. *Measuring informality: A Statistical Manual on the Informal Sector and Informal Employment*. Geneva: 2012; available at: www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_182300.pdf.

[142] Colombia. Departamento Administrativo Nacional de Estadistica. Metodología: Encuesta de microestablecimientos. Bogota, 2009.

[143] It followed the approach in Stork C and Esselaar S, eds.. *Towards an African e-Index: SME e-Access and Usage*. Witwatersrand, Link Centre, 2006; available at: http://www.researchictafrica.net/publications/Research_ICT_Africa_e-Index_Series/SME%20e-Access%20and%20Usage%20in%2014%20African%20Countries.pdf.

[144] RIA. Survey methodology. Household and business surveys in African countries. Unpublished, 2013..

[145] LIRNEasia. Improving service delivery for e-inclusion. Colombo, 2013; available at: http://lirneasia.net/projects/2012-2014-research-program/improving-service-delivery-for-e-inclusion/.

[146] Malhotra A, Kanesathasan A and Patel P. *How mobile phones, computers and the Internet can catalyze women's entrepreneurship: the case of India*. Washington, DC, International Center for Research on Women, 2012.

[147] RIA. Gender and entrepreneurship in the informal sector: An African perspective. Paper presented at the Communication Policy Research Asia/Africa conference on Innovation & Entrepreneurship in ICT: Changing Asia/Africa, Mysore, India, 5-7 September 2013. Unpublished.

[148] The inequality was the most pronounced in Ethiopia, where 46.4 per cent of male-owned businesses used mobile phones for business purposes compared with 3.2 per cent of female-owned businesses. (RIA. Gender and entrepreneurship in the informal sector, 2013).

[149] The UNCTAD ICT questionnaire defines use of ICTs for business processes for the following purposes: customer relationship management, finance, budget and account management, human resource management, product design and development, logistics (inbound and outbound) and inventory control, product service and support, and knowledge management (UNCTAD, *Manual for the Production of Statistics on the Information Economy* revised edition, 2009).

[150] The gap was biggest in Uganda where men were more than twice as likely as women to own Internet-enabled phones (RIA. Lifting the veil on ICT : Gender Indicators in Africa, 1. Cape Town, 2013).

[151] This indicator has been suggested by UNCTAD but not yet collected (UNCTAD, *Manual for the Production* of Statistics on the Information Economy, revised edition. Geneva, 2009).

[152] See Partnership on Measuring ICT for Development and Economic Commission for Africa. *Framework for a Set of e-government Core Indicators*, 2011.

[153] Partnership on Measuring ICT for Development. *Measuring the WSIS Targets: A Statistical Framework*. Geneva, ITU, 2011: 60.

[154] Pre-testing of these two survey questions on EG1 and EG2 in certain developing countries showed that there may be difficulties in answering them, as respondents did not know the exact proportion. Sex disaggregation can represent an additional difficulty in this case.