Estimating Internet Users: An evidence-based alternative in the absence of survey data

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Executive Summary

Numerous Information and Communication Technology (ICT) indicators are measured by the International Telecommunication Union (ITU) and used as elements of composite indicators. The present paper seeks to improve the measurement of one of the most widely used, the indicator '*proportion of individuals using the Internet'*. Errors in such base indicators ripple through the system causing significant errors in composite indicators, and should be minimized.

There are significant shortcomings in the current method of estimating the proportion of Internet users in countries where demand-side data are unavailable. In the absence of demand-side surveys, governments calculate the proportion of Internet users based on the number of subscriptions and a multiplier, which leads to unrealistic values. The reported number of subscriptions is also often inaccurate.

This paper explores the possibility of using the readily available income and education components of the Human Development Index (HDI) to define a new index that will provide a more accurate estimate of the proportion of individuals using the Internet. A regression analysis, between Internet users per 100 and this new index, for countries where demand-side surveys have been conducted shows a strong correlation between the two.

Using these data, a model was derived which enables the estimation of the proportion of individuals using the Internet given the income and education level. It is proposed that this evidence based estimation method be used in the absence of demand side surveys instead of arbitrary multipliers provided by country administrations. If national circumstances justify higher numbers, that should be supported by a demand-side survey. The proposed method will create incentives for the conduct of national demand-side surveys.

1. Introduction

With the growth of information and communication technologies (ICTs), and their enormous contribution to economic and social progress of countries, there is an increasing demand for accurate measurement of ICT access and use (Calderaro, 2009, ITU, 2011b). Within countries, ICT indicators are used to assess progress made. Indicators of performance must be specified in terms of internationally accepted definitions and capable of comparative assessment, especially in the context of a rapidly expanding sector such as ICT.

Annex 2 shows a set of core indicators, based on the availability of comparative data from the International Telecommunication Union (ITU) for benchmarking. The ITU relies on the likes of National Statistics Organisations (NSO) and National Regulatory Authorities (NRA) to provide data in response to questionnaires. The data collection itself poses shortcomings due to the various methodologies used to collect the same indicator and often the lack of reliable data sources.

The present paper places the greatest emphasis on 'proportion of individuals using the Internet'. This is partly due to the challenges of arriving at accurate and realistic estimates in the absence of up-to-date, representative survey data from countries (Beilock & Dimitrova, 2003, Donner & Toyama 2009, Donat, Brandtweiner & Kerschbaum, 2009). It is also a base indicator that is used in composite indices such as the IDI (ICT Development Index), NRI (Network Readiness Index), Digital Economy Index (previously e-readiness Index) and KEI (Knowledge Economy Index) (Dutta & Bilbao-Osorio 2012, Economist Intelligence Unit, 2010, ITU 2011b). It is obviously an important, and indeed indispensable, indicator when all eyes are on the emergence of an Internet Economy. Errors in such base indicators ripple through the system, sometimes diluted and sometimes accentuated. Therefore, it is imperative that best efforts be made to ensure that errors are minimized. This paper focuses on developing a new evidence-based methodology to estimate the proportion of individuals using the Internet in the absence of demand side surveys.

In addition to being a base indicator for composite indices used to assess countries' ICT policies, Internet user penetration is also used to assess the achievement of target eight (developing a global partnership for development) of the Millennium Development Goals[1] (UN, 2010). It is also a key indicator in measuring the World Summit on the Information Society (WSIS)[2] Target 10 which seeks to "Ensure that more than half the world's inhabitants have access to ICTs within their reach and make use of them" (ITU, 2011c).

1.1 Factors that affect Internet penetration

In 1963, Jipp established a strong correlation between teledensity and economic development (Jipp, 1963). While this was based on telephone penetration, its relevance can be extended to Internet penetration today. In addition to income, an Internet user also must be literate in order to be able to make the maximum use of the Internet (Chaudhuri, Flamm & Horrigan, 2005, Hilbert 2012).

Hilbert & Peres conducted a multivariate discriminative analysis of ten attributes (including Education, Income, Household Size, Age, Gender and Ethnicity) in South American countries, testing for household Internet access penetration. They concluded that the main factors driving Internet

[1] The Millennium Development Goals are eight international development goals that all United Nations member states have agreed to achieve by the year 2015 (UN, 2010)

[2] WSIS was held to discuss the use of Information and Communication Technologies (ICT) for development. At the conclusion, governments agreed to strive to reach ten targets related to ICTs by the year 2015 (ITU, 2011c)

penetration are income and education (Hilbert & Peres 2010).

In addition, according to the ITU survey data, countries with high income have the highest Internet and computer penetration. A correlation between the education level and proportion of individuals using the Internet exists in the countries which have conducted representative-sample surveys on Internet use (ITU 2011b).

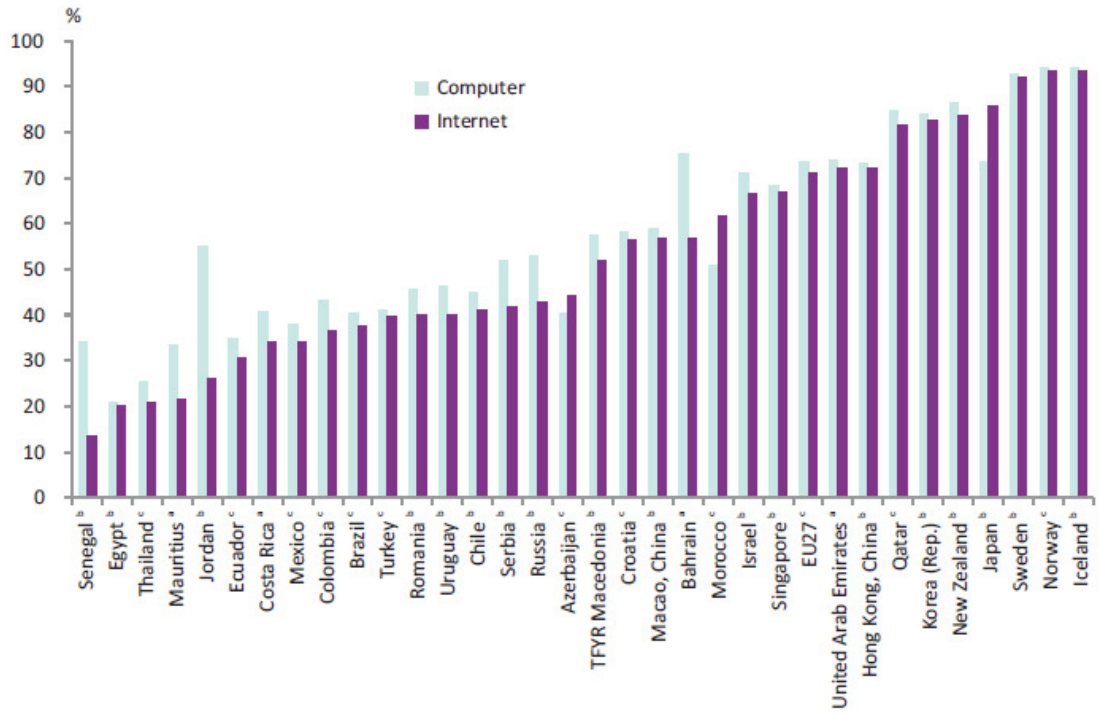

Figure 1: Percentage of individuals using the Internet and computers in countries that have conducted demand side surveys in 2008 - 2010 *Source: ITU, 2011b*

1.2 Problems with the current method of estimating Internet users

The most reliable way of measuring the proportion of individuals using the Internet is through demand-side or household surveys (ITU 2011a). The Core ICT Indicators 2010 published by the Partnership on Measuring ICT for Development captures this through indicator HH7 (Proportion of individuals who used the Internet (from any location) in the last 12 months), among others. However, demand-side surveys are costly. Many countries do not conduct regular surveys on ICTs as can be seen from figure 2. Another problem is that sometimes, even when demand-side surveys have been conducted by organisations other than the government, they are not included in the ITU Internet user result. For example, Research ICT Africa (RIA) has conducted demand-side surveys of 17 African countries, including Rwanda. It had a penetration of 2% in 2008 (Gillwald & Stork, 2008), but ITU reported 7.9% for the same year (ITU indicator database). Although RIA figures have not been included in ITU indicator data, they are mentioned in the *Measuring the Information Society* Report (ITU, 2011b).

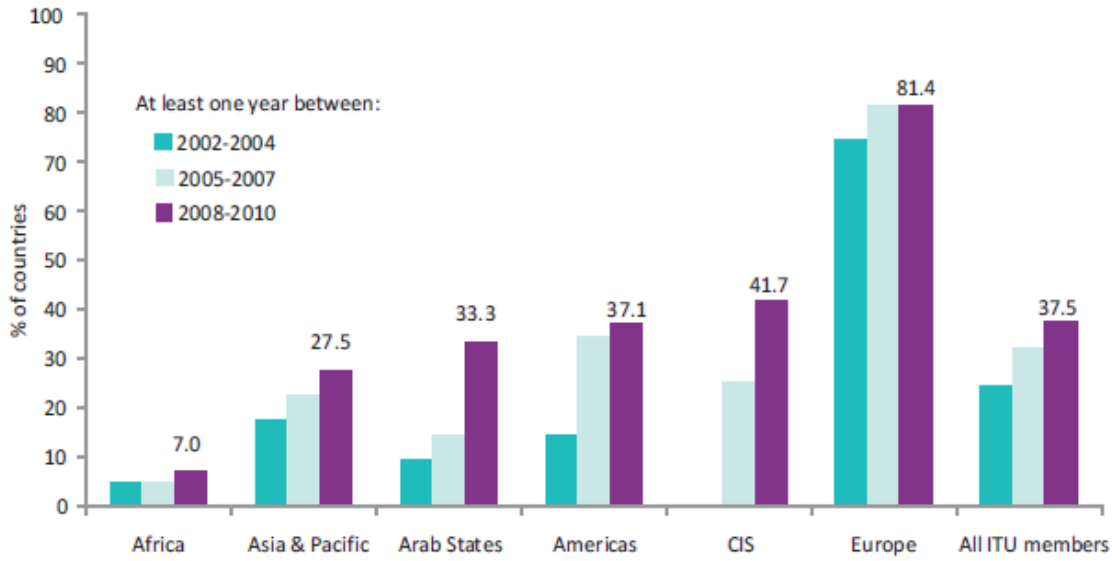

Figure 2: Percentage of countries collecting data on Internet usage, total and by region *Source: ITU, 2011b*

The current method of measuring Internet users in the absence of survey data is to estimate based on the number of total Internet subscriptions, using a multiplier to account for people who use Public Internet Access Points (PIAPs) or people who use the Internet at their work places, schools or other locations. The latest definition for the Estimated Internet Users (indicator 4212, in ITU 2010a) states that "In situations where surveys are not available, an estimate can be derived based on the number of Internet Subscriptions".

Theoretically, the Number of Internet Subscriptions should be the sum of internet subscriptions of all types/technologies and all speeds including both fixed (wired) and mobile (wireless) Internet subscriptions. However, this method of adding subscriptions could lead to significant over-counting. Furthermore, mobile broadband subscriptions are measured by the indicator "Standard mobile subscriptions with use of data communications at broadband speeds" (indicator 271mb_use, as per ITU 2010a). This measures subscriptions with potential access rather than actual active subscriptions. In the past few years, OECD countries have started to report active mobile broadband subscriptions (i.e. mobile broadband subscriptions which have been used at least once every quarter), but many other countries still report on the number of data enabled SIMs.

While some countries over-report, in other countries this indicator is under-reported due to the use of mobile data from post-paid connections. For example in Sri Lanka, all SIMs provided by a major operator are data enabled. Therefore, even without a specific data plan, any customer with a data-compatible mobile phone can use the Internet, but they are not all counted by the operator and thus not reported. As a result, data have become incomparable across countries, with some countries reporting potential access, others active use and yet others none at all. The ITU is currently trying to harmonize these different types of data and has requested countries to report only active mobile broadband connections (ITU, 2011b).

In addition to the issues of estimating the total number of subscriptions, ITU allows national administrations to use multipliers at their discretion to estimate the number of users from the number of subscriptions. This may be to account for differences in family size and use of Public Internet Access Points, but there is no guidance or consistency. However ITU is trying to discourage this practice. In 2010 ITU stopped collecting the 'number of Internet users' and is rather collecting the 'proportion of

Internet users' (from the total population). This intends to send the message to countries that the proportion should come from sample surveys or censuses. Even if the indicator is expressed as a proportion, many countries are still using the multiplier to calculate it. Therefore, naturally, a question may be raised on the possibility of larger multipliers being used to show a higher number of Internet users in a country. For example, the database shows that Afghanistan used a multiplier of 500 (2,000 Internet subscriptions and 1,000,000 Internet users in 2009, subscription data for 2010 is not available for Afghanistan to compare). This is in contrast to the multiplier of 13 used by Burundi, a somewhat similarly situated country (5,000 subscriptions and 65,000 users, also in 2009).

Given these significant problems, a different methodology to estimate Internet penetration is proposed in this study.

2. Alternative method of estimating proportion of individuals using the Internet

2.1 Methodology

The hypothesis that the multiplier is inversely correlated with income level and declines as country income level increases was the original basis of the study (Samarajiva & Lucas 2010). The hypothesis was based on the fact that more people from lower-income countries access the Internet from Public Internet Access Points (PIAP), while in higher-income countries most people have Internet at home. As such, more Internet users per subscription are likely in lower-income countries, with the number inversely correlated to income level.

However during the research, difficulties in estimating total number of Internet subscriptions were identified as described in section 1.2. Since summing fixed and mobile subscriptions leads to significant over counting, initially only fixed Internet subscriptions were considered as the total. Especially in the developing world, the use of mobile Internet is very high (Wortham, 2010, Gillwald & Stork 2008). Therefore using only fixed subscriptions would be inaccurate. In Kenya for example 99% of Internet subscriptions are mobile including GPRS, EDGE and 3G mobile (ITU, 2011b).

In section 1.1 it was observed that income and education are the main factors influencing Internet penetration. Therefore the possibility of imputing the proportion of individuals using the Internet for countries which have not conducted demand-side surveys, based on their income and education level was explored, instead of trying to improve the multiplier.

A regression analysis was carried out on the actual proportion of individuals using the Internet (for countries where demand side surveys on Internet use have been conducted) and an Index created only using the Education and Income components of the Human Development Index (HDI). HDI was developed by United Nations Development Programme (UNDP) by combining indicators of life expectancy, educational attainment and income into a composite human development index.

The new index (HDI_EdGNI) was created using only the education and income components of HDI since there is no evidence that Internet penetration is correlated with life expectancy. In HDI_EdGNI, income and education are given equal weight[3]. The education component of the HDI is measured by mean of years of schooling for adults aged 25 years and expected years of schooling for children of school-going age. The income component is measured by GNI per capita (PPP$). The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing GNI (UNDP, 2011).

[3] HDI_EdGNI was calculated using 'Build your own Index' from UNDP data http://hdr.undp.org/en/data/build/

Figure 3 shows the correlation between HDI_EdGNI Index and the proportion of individuals using the Internet. Regression analysis gives the best fit for the correlation, with adjusted R squared value of 0.85, as in equation 1.

$$y = 0.4 \times e^{6x} \qquad (1)$$

where x = new index HDI_EdGNI

y = proportion of Internet users

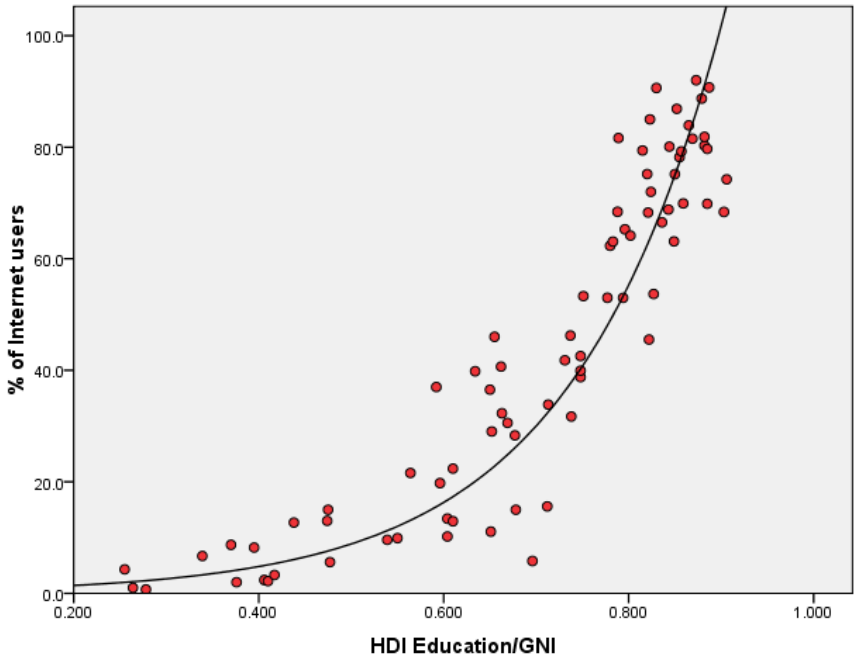

Figure 3: Proportion of individuals using the Internet correlated with education and income components of HDI Index of countries for which demand-side survey results are available
Source: Authors

Survey Data (2010/2011) were obtained from the ITU Market Information and Statistics division. Since there is a lack of African survey data in the ITU set, it was complemented by data from household surveys conducted by Research ICT Africa (RIA) in 11 African countries in 2011. HDI data are from 2010 because over 60% of the survey data was from 2010.

For countries which conducted a survey, the average variance between the model and survey was found to be around seven percentage points. Therefore it seems reasonable that the proportion of individuals using the Internet should fall within a band of +/- 7 percentage points from the figures calculated by the new model. Therefore, it is recommended that for countries which have not conducted demand-side surveys, the proportion of individuals using the Internet estimated by country administrations should be restricted to be within +/- 7 percentage points from the model prediction.

2.2 Internet user penetration-rate estimation procedure

ITU has an obligation to identify, define, and produce statistics covering telecommunication/ICT sector internationally (ITU EYE, ICT Statistics Database). It is also the official dataset used in calculating the ICT indices mentioned in section 1. Annually the ITU sends questionnaires to all countries to report on ICT indicators including proportion of individuals using the Internet. It is proposed that the ITU adopt the following procedure to estimate the 'proportion of individuals using the Internet'.

If the country has conducted a demand-side survey on the proportion of individuals using the Internet, in the given year, then its result should be used. Else, if another regional organisation such as RIA has conducted a representative survey for the corresponding year, its result should be used. In instances where the country has conducted surveys previously, but does not have survey data for the current year, the Internet user penetration for the corresponding year should be estimated assuming steady growth based on historical survey data. In the case there is only a single demand-side survey; the growth rate of a similar country in the region with similar GNI and education level should be used. In case a country has never conducted a demand-side survey, the ITU should calculate the HDI_EdGNI for the country, and impute the estimated proportion of individuals using the Internet through the equation 1 using HDI_EdGNI as x. If the penetration rate given by the country administration is within the +/- 7 percentage point band of the new calculated estimate, then the figure provided by the country administration should be used, else the new figure generated by the new (proposed) method should be used.

Figure 4 illustrates this procedure. This reduces the inconsistency in the way the Internet penetration is calculated. It is a more scientific method. Country administrations will continue to send the penetration rate, but subjects them to safeguards in the form of approximate bands derived from objective data. Countries that want to overcome this limitation will be encouraged to conduct demand-side surveys.

The model can and should evolve with time; especially as people obtain more Internet connections in the home and more countries conduct demand-side surveys. This will enable the formula to be sharpened. Therefore, it is necessary to re-analyse the existing demand-side Internet user data with education and income components of the HDI and create a new model to estimate the proportion of Internet users annually. This can be done soon after the UNDP publishes the HDI index at the end of each year.

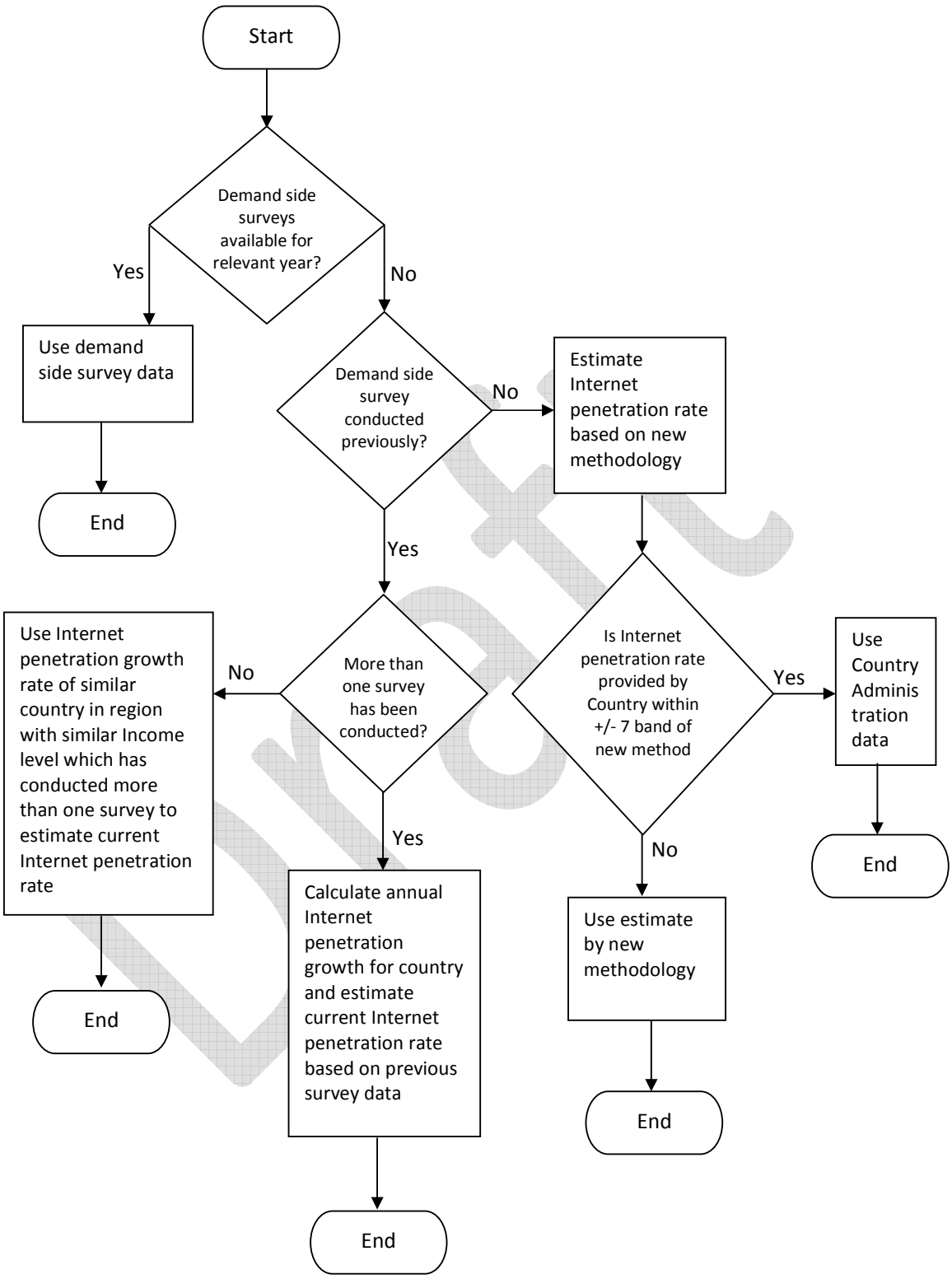

Figure 4 – Flow chart of steps for proposed process for arriving at more reasonable estimates for Internet Users. *Source: Authors*

2.3 The impact of the new methodology on existing proportion of internet users reported by ITU

The new methodology is a minor modification except for countries which seem to have significant over or under counts of Internet penetration unsupported by evidence. The estimated proportion of individuals using the Internet according to the new method is in Annex 1.

Figure 5 shows that most of the numbers reported by the ITU and the new methodology are the same (as shown by the diagonal). The outliers are highlighted. The largest discrepancies between ITU data and data from the new method exist in many of the Caribbean Islands, where the ITU figures are around 50 – 80%. According to the survey data, the average penetration rate for Caribbean Islands is around 20 – 40%, which is closer to the figures obtained by the new method. Therefore, the new method seems to be giving an estimate closer to the actual figures. There are also a number of African countries where ITU data and data through the new method are different, since the RIA data has been included (marked in dark blue).

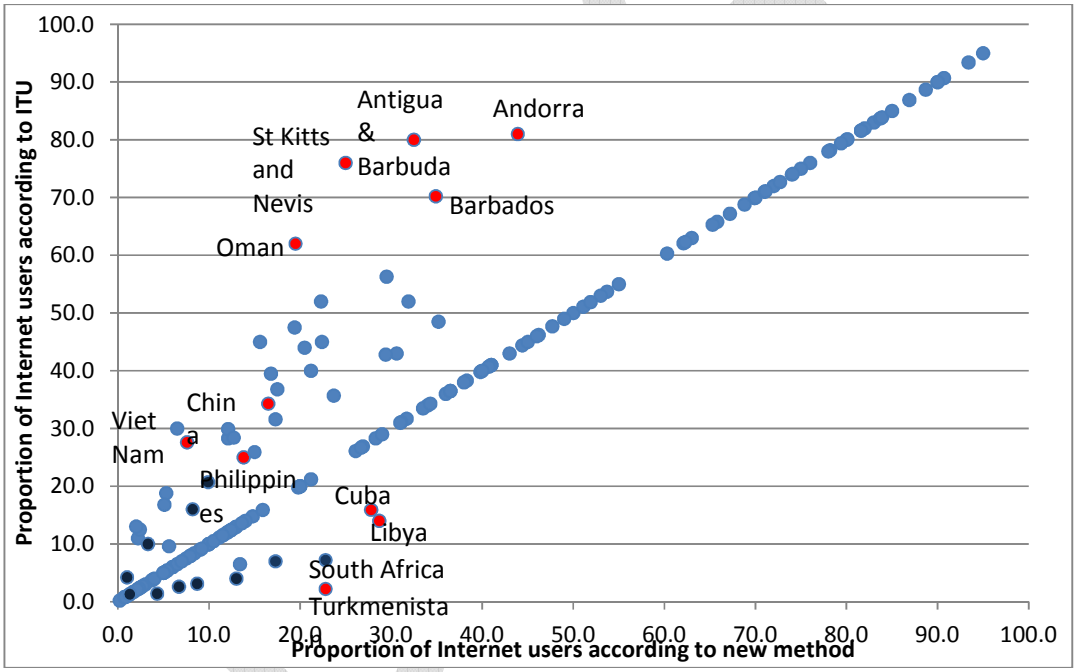

Figure 6 – Comparison between numbers reported by ITU and numbers according to new method. *Source: Authors*

2.4 Implications for ICT indicators

The entire enterprise of collecting and disseminating ICT indicators is in crisis. The basic methods of data collection were designed for monopoly provision of a limited set of services by government-owned or regulated entities, known quaintly as "administrations." Since the reforms of the past three decades,[4] the markets for ICT services have grown in complexity with multiple suppliers striving to meet consumer needs in workably competitive settings. New business models have emerged yielding a range of price-quality bundles in a range of services unimaginable in the monopoly days. ICT service markets have begun increasingly to resemble fast moving consumer goods (FMCG) markets rather than supplier

[4] It is customary to anchor the start of the reform wave to 1984 when three major events, the AT&T Divestiture in the US, the privatization of British Telecom, and the partial privatization of NTT in Japan, occurred.

dominated public-utility markets. In particular, the Budget Telecom Network Model for mobile voice services, a new business model that first emerged in South Asia and is now rapidly spreading throughout the developing world (Samarajiva, 2009), has made the conventional associations between subscribers and users obsolete. For example, this model leads to practically giving away SIMs or connections, making untenable the ITU definition of a mobile subscription. For example 23 percent of owners in Socio-Economic Classifications D and E (the bottom of the pyramid, or BOP) in Pakistan were reported in 2008 as having more than one active SIM, with some even reporting as many as five active SIMs (see Figure 5). In recognition of this, ITU now collects/reports subscriptions, instead of subscribers, as it previously did.

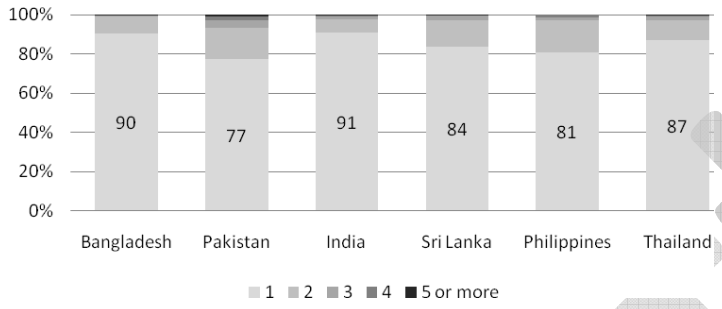

Figure 6: Ownership of (active) multiple SIMs (% of SEC D and E mobile owners), 2008
Source: LIRNEasia (2010).

With the ICT sector increasingly beginning to resemble the FMCGs, the old supply-side data dominated indicators simply do not work. New retail-audit type data collection mechanisms have yet to emerge.

In the future, the measurement of number of Internet subscriptions will become obsolete with the advent of fourth generation (4G) telecommunication networks, and possibly even earlier with the use of applications such as Gtalk on smartphones on 3G networks. In 4G networks voice and data will be converged and it will not be possible for network operators to differentiate between the two, even if they wanted to, which is doubtful because voice will be simply one bundled data application. This future is foretold by the difficulties of calculating mobile broadband even in a 3G environment in Sri Lanka. The proposed method could still be used to estimate the proportion of Internet users, even after it becomes impossible to differentiate between voice and data. On the supply side it may be necessary to develop a new indicator on the volume of data per user instead of number of Internet and mobile subscriptions.

3. Conclusion

This paper suggests an evidence-based alternative method to estimate the proportion of individuals using the Internet using readily available income and education data (components of the HDI). The proposed method does not drastically change the proportion of individuals using the Internet of most countries as can be seen from Annex 1. It is an intellectually defensible method and will be consistent across all countries without demand-side data.

This method operationalizes the principle that demand-side data is first best and therefore suggests including representative survey results from regional research organisations such as RIA, even if they are not identical to the results provided by the country administrations. It also removes the most egregious uses of high multipliers and the problems of accurately estimating the total subscriptions in a country. It is based on income and education levels which have been considered by many researchers (Hilbert 2012, ITU 2011b) as the main drivers of Internet use.

It creates strong incentives for countries to conduct demand-side surveys in order to escape the constraint of the mathematically derived estimate. If a national authority believes that it actually has a higher proportion of Internet users than the model predicts, all it has to do is to conduct a demand-side survey to prove it.

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Annex 1: Internet users/100 estimated using current and new methods

Country	HDI_EdGNI Index	Internet Users ITU	Internet Users according to survey, where available	Internet Users according to New Method	Variance between ITU and New Method
Afghanistan	0.373	4.0		4.0	0.0
Albania	0.671	45.0		22.4	22.6
Algeria	0.636	12.5		12.5	0.0
Andorra	0.783	81.0		43.9	37.1
Angola	0.484	10.0		10.0	0.0
Antigua & Barbuda	0.733	80.0		32.5	47.5
Argentina	0.758	36.0		36.0	0.0
Armenia	0.656	44.0		20.5	23.5
Australia	0.906	76.0	76.0	76.0	0.0
Austria	0.85	72.7	72.7	72.7	0.0
Azerbaijan	0.655	46.0	46.0	46.0	0.0
Bahamas	0.723	43.0		30.6	12.4
Bahrain	0.777	55.0	55.0	55.0	0.0
Bangladesh	0.403	3.7		3.7	0.0
Barbados	0.745	70.2		34.9	35.3
Belarus	0.738	31.7	31.7	31.7	0.0
Belgium	0.857	75.0	75.0	75.0	0.0
Belize	0.621	14.0		14.0	0.0
Benin	0.37	3.1	8.7	8.7	-5.6
Bhutan	0.437	13.6		13.6	0.0
Bolivia	0.63	20.0		20.0	0.0
Bosnia and Herzegovina	0.67	52.0		22.3	29.7
Botswana	0.696	6.0	29.0	29.0	-23.0
Brazil	0.662	40.7	40.7	40.7	0.0
Brunei Darussalam	0.802	50.0		50.0	0.0
Bulgaria	0.737	46.2	46.2	46.2	0.0
Burkina Faso	0.255	1.4		4.3	-2.9
Burundi	0.257	2.1		2.1	0.0
Cambodia	0.458	1.3		1.3	0.0
Cameroon	0.474	4.0	14.1	14.1	-10.1
Canada	0.882	81.6	81.6	81.6	0.0
Cape Verde	0.464	30.0		6.5	23.5
Central African Rep.	0.3	2.3		2.3	0.0
Chad	0.275	1.7		1.7	0.0
Chile	0.748	45.0	45.0	45.0	0.0
China	0.62	34.3		16.5	17.8
Colombia	0.65	36.5	36.5	36.5	0.0
Comoros	0.354	5.1		5.1	0.0
Congo	0.506	5.0		5.0	0.0
Congo	0.229	5.0		5.0	0.0
Costa Rica	0.663	36.5	36.5	36.5	0.0

Country	HDI_EdGNI Index	Internet Users ITU	Internet Users according to survey, where available	Internet Users according to New Method	Variance between ITU and New Method
Côte d'Ivoire	0.339	2.6		6.7	-4.1
Croatia	0.751	60.3	60.3	60.3	0.0
Cuba	0.707	15.9		27.8	-11.9
Cyprus	0.794	53.0	53.0	53.0	0.0
Czech Republic	0.843	68.8	68.8	68.8	0.0
Denmark	0.879	88.7	88.7	88.7	0.0
Djibouti	0.364	6.5		6.5	0.0
Dominica	0.647	47.5		19.4	28.0
Dominican Rep.	0.623	39.5		16.8	22.7
Ecuador	0.652	29.0	29.0	29.0	0.0
Egypt	0.564	26.7	26.7	26.7	0.0
El Salvador	0.61	15.9	15.9	15.9	0.0
Equatorial Guinea	0.563	6.0		6.0	0.0
Eritrea	0.255	5.4		5.4	0.0
Estonia	0.82	74.1	74.1	74.1	0.0
Ethiopia	0.278	0.8	2.7	2.7	-1.9
Fiji	0.648	14.8		14.8	0.0
Finland	0.852	86.9	86.9	86.9	0.0
France	0.844	80.1	80.1	80.1	0.0
Gabon	0.674	7.2		22.8	-15.6
Gambia	0.349	9.2		9.2	0.0
Georgia	0.682	26.9		26.9	0.0
Germany	0.882	82.0	82.0	82.0	0.0
Ghana	0.477	9.6	12.7	12.7	-3.1
Greece	0.822	44.4	44.4	44.4	0.0
Grenada	0.688	33.5		33.5	0.0
Guatemala	0.484	10.5		10.5	0.0
Guinea	0.276	1.0		1.0	0.0
Guinea-Bissau	0.315	2.5		2.5	0.0
Guyana	0.568	29.9		12.1	17.8
Haiti	0.375	8.4		8.4	0.0
Honduras	0.539	11.1	11.1	11.1	0.0
Hong Kong	0.855	72.0	72.0	72.0	0.0
Hungary	0.796	65.3	65.3	65.3	0.0
Iceland	0.862	95.0	95.0	95.0	0.0
India	0.478	7.5		7.5	0.0
Indonesia	0.55	9.9	9.9	9.9	0.0
Iran	0.651	13.0	13.0	13.0	0.0
Iraq	0.493	2.5		2.5	0.0
Ireland	0.885	69.9	69.9	69.9	0.0
Israel	0.849	67.2	67.2	67.2	0.0
Italy	0.827	53.7	53.7	53.7	0.0
Jamaica	0.678	26.1		26.1	0.0
Japan	0.855	78.2	78.2	78.2	0.0
Jordan	0.635	38.0	38.0	38.0	0.0

Country	HDI_EdGNI Index	Internet Users ITU	Internet Users according to survey, where available	Internet Users according to New Method	Variance between ITU and New Method
Kazakhstan	0.746	34.0		34.0	0.0
Kenya	0.475	25.9	26.3	26.3	-0.4
Kiribati	0.565	9.0		9.0	0.0
Korea	0.869	83.7	83.7	83.7	0.0
Kuwait	0.714	38.3		38.3	0.0
Kyrgyzstan	0.556	20.0		20.0	0.0
Latvia	0.788	71.1	71.1	71.1	0.0
Lebanon	0.697	31.0		31.0	0.0
Lesotho	0.452	3.9		3.9	0.0
Liberia	0.247	7.0		7.0	0.0
Libya	0.712	14.0		28.7	-14.7
Liechtenstein	0.888	80.0		80.0	0.0
Lithuania	0.802	62.1	62.1	62.1	0.0
Luxembourg	0.83	90.0	90.0	90.0	0.0
Macedonia	0.668	51.9	51.9	51.9	0.0
Madagascar	0.387	1.7		1.7	0.0
Malawi	0.344	2.3		2.3	0.0
Malaysia	0.717	56.3		29.5	26.8
Maldives	0.568	28.3		12.1	16.2
Mali	0.306	2.7		2.7	0.0
Malta	0.783	63.0	63.0	63.0	0.0
Mauritania	0.391	3.0		3.0	0.0
Mauritius	0.677	28.3	28.3	28.3	0.0
Mexico	0.713	31.1	31.1	31.1	0.0
Micronesia	0.577	20.0		20.0	0.0
Moldova	0.592	40.0	40.0	40.0	0.0
Mongolia	0.604	12.9	12.9	12.9	0.0
Montenegro	0.73	52.0		31.9	20.1
Morocco	0.489	49.0	49.0	49.0	0.0
Mozambique	0.264	4.2		1.0	3.2
Namibia	0.604	6.5	16.2	16.2	-9.7
Nepal	0.354	7.9		7.9	0.0
Netherlands	0.887	90.7	90.7	90.7	0.0
New Zealand	0.885	83.0	83.0	83.0	0.0
Nicaragua	0.49	10.0		10.0	0.0
Niger	0.217	0.8		0.8	0.0
Nigeria	0.438	28.4	18.4	18.4	10
Norway	0.933	93.4	93.4	93.4	0.0
Oman	0.648	62.0		19.5	42.5
Pakistan	0.423	16.8		5.1	11.7
Palau	0.764	...		39.2	
Panama	0.716	42.8		29.4	13.4
Papua New Guinea	0.387	1.3		1.3	0.0
Paraguay	0.596	19.8	19.8	19.8	0.0
Peru	0.669	34.3	34.3	34.3	0.0

Country	HDI_EdGNI Index	Internet Users ITU	Internet Users according to survey, where available	Internet Users according to New Method	Variance between ITU and New Method
Philippines	0.59	25.0		13.8	11.2
Poland	0.78	62.3	62.3	62.3	0.0
Portugal	0.751	51.1	51.1	51.1	0.0
Qatar	0.789	81.6	81.6	81.6	0.0
Romania	0.748	39.9	39.9	39.9	0.0
Russia	0.748	43.0	43.0	43.0	0.0
Rwanda	0.376	13.0	6.0	6.0	7.0
S. Tomé & Principe	0.432	18.8		5.3	13.4
Saint Kitts & Nevis	0.689	76.0		25.0	51.0
Samoa	0.628	7.0		17.3	-10.3
Saudi Arabia	0.733	41.0		41.0	0.0
Senegal	0.395	16.0		8.2	7.8
Serbia	0.724	40.9	40.9	40.9	0.0
Seychelles	0.74	41.0		41.0	0.0
Sierra Leone	0.295	...		2.3	
Singapore	0.821	71.0	71.0	71.0	0.0
Slovakia	0.815	79.4	79.4	79.4	0.0
Slovenia	0.859	70.0	70.0	70.0	0.0
Solomon Islands	0.419	5.0		5.0	0.0
South Africa	0.678	12.3	33.7	33.7	-21.4
Spain	0.836	65.8	65.8	65.8	0.0
Sri Lanka	0.616	12.0		12.0	0.0
St. Lucia	0.662	40.0		21.2	18.8
Sudan	0.322	...		2.8	
Suriname	0.628	31.6		17.3	14.3
Swaziland	0.561	8.0		8.0	0.0
Sweden	0.873	90.0	90.0	90.0	0.0
Switzerland	0.865	83.9	83.9	83.9	0.0
Syria	0.535	20.7		9.9	10.8
Tajikistan	0.547	11.6		11.6	0.0
Tanzania	0.41	11.0	3.5	3.5	7.5
Thailand	0.61	21.2	21.2	21.2	0.0
Timor-Leste	0.425	0.2		0.2	0.0
Togo	0.375	5.4		5.4	0.0
Tonga	0.65	12.0		12.0	0.0
Trinidad & Tobago	0.746	48.5		35.2	13.3
Tunisia	0.63	36.8		17.5	19.3
Turkey	0.634	39.8	39.8	39.8	0.0
Turkmenistan	0.674	2.2		22.8	-20.6
Uganda	0.406	12.5	7.9	7.9	4.6
Ukraine	0.712	45.0		15.6	29.4
United Arab Emirates	0.824	78.0	78.0	78.0	0.0
United Kingdom	0.823	85.0	85.0	85.0	0.0
United States	0.903	74.0	74.0	74.0	0.0
Uruguay	0.731	47.7	47.7	47.7	0.0

Country	HDI_EdGNI Index	Internet Users ITU	Internet Users according to survey, where available	Internet Users according to New Method	Variance between ITU and New Method
Uzbekistan	0.588	20.0		20.0	0.0
Vanuatu	0.54	8.0		8.0	0.0
Venezuela	0.68	35.7		23.7	12.0
Viet Nam	0.49	27.6		7.6	20.0
Yemen	0.371	12.4		12.4	0.0
Zambia	0.417	10.0		3.3	6.7
Zimbabwe	0.328	11.5		11.5	0.0

**Highlighted country survey data have been obtained from Research ICT Africa for 2011*

Annex 2: Core ICT Indicators

Core indicators on ICT infrastructure and access

A1	Fixed telephone lines per 100 inhabitants
A2	Mobile cellular telephone subscriptions per 100 inhabitants
A3	Fixed Internet subscribers per 100 inhabitants
A4	Fixed broadband Internet subscribers 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 tariffs per month: In US$ As a percentage of monthly *per capita* income
A9	Mobile cellular telephone prepaid tariffs per month: In US$ As a percentage of monthly *per capita* income
A10	Percentage of localities with public Internet access centres (PIACs)

Source: http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ICT_CORE-2010-PDF-E.pdf

Core indicators on access to, and use of, ICT by households and individuals

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

	Internet banking *Education or learning activities* *Playing or downloading video games or computer games* *Downloading movies, images, music, watching TV or video, or listening to radio or music* *Downloading software* *Reading or downloading online newspapers or magazines, electronic books*
HH10	Proportion of individuals who used a mobile cellular telephone in the last 12 months
HH11	Proportion of households with access to the Internet by type of access: Narrowband Fixed broadband Mobile broadband
HH12	Frequency of individual use of the Internet in the last 12 months: *At least once a day* *At least once a week but not every day* *Less than once a week*
HHR1	Proportion of households with electricity

Source: http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ICT_CORE-2010-PDF-E.pdf