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

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Contents

Abstract

Purpose

There are significant shortcomings in the current method of estimating the indicator '*proportion of Internet users'* by the International Telecommunication Union (ITU) 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 arbitrary values. Errors in such base indicators ripple through the system causing significant errors in composite indicators, and should be minimized.

Design/methodology/approach

The drivers of Internet use were found out to be income and education. Then a regression analysis between Internet users per 100 in countries which conducted demand-side surveys and a new index, based on the income and education components of the Human Development Index (HDI), was conducted.

Findings

The regression analysis showed a strong correlation between the proportion of Internet users in a country and the new income and education Index. Using these data, a new methodology that creates incentives for governments to conduct demand-side surveys and reduce the errors yielded by the previous methodology was then developed.

Social implications

It is proposed that this evidence-based estimation method be used by ITU in the absence of demand-side surveys instead of arbitrary multipliers applied to estimated subscription numbers provided by governments. If governments believe that their national circumstances justify higher numbers, they can conduct demand-side surveys.

Originality/value

This paper explores the possibility of using the readily available HDI data to define a new index that will provide a more accurate estimate of the proportion of individuals using the Internet.

1. Introduction

The rapid growth of information and communication technologies (ICTs) and interest in their contribution to economic and social progress has increased demand for accurate measurement of ICT access and use (Calderaro, 2009, ITU, 2011b). 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.

Currently the most widely cited source for country-level ICT indicator data is the International Telecommunication Union (ITU). The ITU relies on National Statistics Organisations (NSOs) and National Regulatory Authorities (NRAs) to provide data in response to questionnaires. In turn, NRAs obtain the data from operators through questionnaires. Differences in the methodologies used to collect data on the same indicator and the lack of reliable data sources lead to flawed results.

One of the weakest indicators published by the ITU is 'proportion of individuals using the Internet'. This is partly due to the difficulties 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 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. They also affect other ITU indicators such as International Bandwidth per Internet user (bits/s). Therefore, it is imperative that best efforts be made to ensure that errors are minimized. This article proposes 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, the proportion of Internet users 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). Within countries, the Internet user indicator can be used to assess the efficacy of policies aimed at increasing Internet use and e-development initiatives.

1.1 Factors that affect Internet use

In 1963, Jipp established a strong correlation between teledensity and economic development (Jipp, 1963). While this was based on fixed-telephones per 100 people, 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 (2010) conducted a multivariate discriminative analysis of ten attributes (including Education, Income, Household Size, Age, Gender and Ethnicity) in South American countries, testing

[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 its conclusion, governments agreed to strive to reach ten targets related to ICTs by the year 2015 (ITU, 2011c)

for factors contributing to household Internet access. They concluded that the main factors are income and education.

In addition, according to the ITU, 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: p 109 - 116).

1.2 Problems with the current method of estimating Internet users

The best way to measure the proportion of individuals using the Internet is a demand-side survey (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 (Figure 1). Another problem is that, sometimes, even when demand-side surveys have been conducted by organisations other than the government, they are not reported by the ITU. For example, Research ICT Africa (RIA) has, for several years, conducted representative demand-side surveys of African countries. In 2011, the RIA survey showed 7.9 percent Internet users in Uganda (http://www.researchictafrica.net/home.php), while ITU reported 13 percent for the same year (ITU indicator database). RIA figures have not been included in ITU indicator data, but are mentioned in the *Measuring the Information Society* Report (ITU, 2011b).

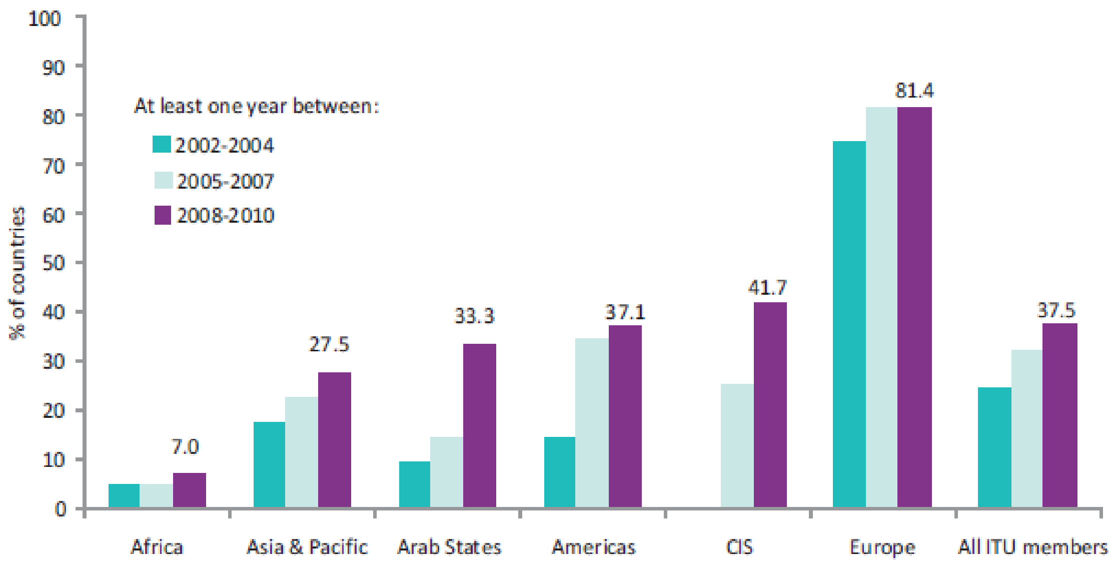

Figure 1: Percentage of countries collecting data on Internet usage, total and by region *Source: ITU, 2011b*

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, especially in the context of smartphone and tablet proliferation. 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 other countries still report the number of data-enabled SIMs.

While some countries over-report, in other countries this indicator is under-reported due to the use of data on pre-paid mobile connections. For example in Sri Lanka, all pre-paid 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 as Internet users 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 data packages and dongles only. 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, ITU allows national authorities to use multipliers at their discretion to estimate the number of users from the number of subscriptions. This may be to account for country realities such as differences in family size and use of Public Internet Access Points etc., but there is no guidance or consistency. However ITU is trying to discourage this practice. In 2010 ITU stopped reporting the 'number of Internet users' and is rather collecting the 'proportion of Internet users' (from the total population). This is intended to send the message to governments that the proportion should come from sample surveys or censuses. Even if the indicator is expressed as a proportion, many countries still use a multiplier to calculate it. There is, naturally, a possibility that larger multipliers will be 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/ 2011 is not available from 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 users 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 is 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. 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 percent of Internet subscriptions are mobile including GPRS, EDGE and 3G mobile (ITU, 2011b).

It was shown above that income and education are the main factors influencing the proportion of Internet users. 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 using only 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 the proportion of Internet users 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).

Figure 2 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 0.8, as in equation 1.

$$y = 1.26 \times e^{4.8x} \qquad (1)$$

where x = new index HDI_EdGNI

y = proportion of Internet users

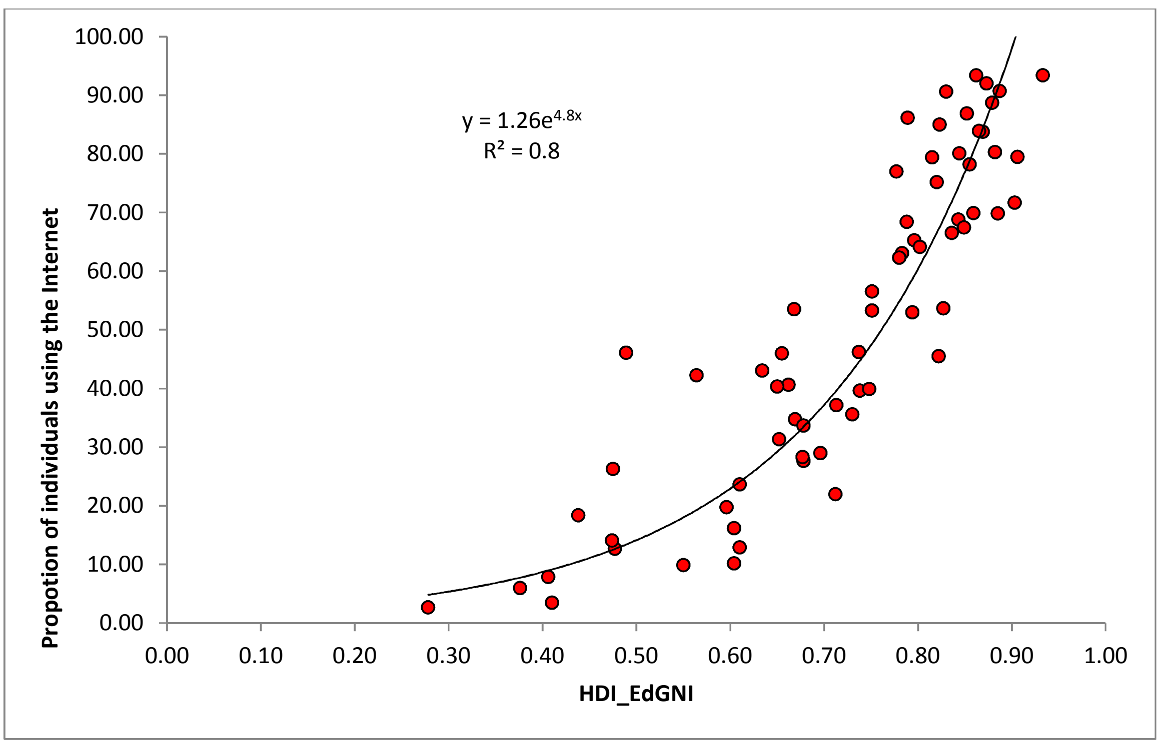

Figure 2: Proportion of individuals using the Internet correlated with education and income

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

components of HDI Index (HDI_EdGNI) 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 2011/2012. HDI data are from 2011 because over 60 percent of the survey data were from 2011.

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 authorities should be restricted to be within +/- 7 percentage points from the model prediction.

2.2 Procedure for estimating Internet users

The 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 composite ICT indices. 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, within 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 proportion of Internet users 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 proportion of Internet users given by the country is within the +/- 7 percentage point band of the new calculated estimate, then the figure provided by the country authority should be used. Otherwise, the new figure generated by the new (proposed) methodology should be used.

Figure 3 illustrates this procedure. This reduces the inconsistency in the way the proportion of Internet users is calculated. It is a more scientific method. Country-supplied data will be protected from egregious error by "guard" bands derived from objective data.

However, the estimation of the proportion of Internet users per 100, using non-ICT sector data may be criticized for not yielding actionable insights on specific policies or the absence thereof. While the estimations may be closer to reality in general, it may be argued that they do not identify instances of Internet use driven by factors other than education and income or countries where the ground realities are different from the ones that have actually conducted surveys.

Erroneous estimations cannot yield useful actionable insights. It is better to create incentives for the conduct of demand-side surveys, which is the first-best method of discovering the proportion of individuals using the Internet in a given country, In the meantime, the method of estimation should yield less-erroneous results than the method currently used. The proposed methodology does both, even leaving room for government estimates as long as they fall within the demarcated band. As more governments conduct demand-side surveys and/or make more reasonable estimations of the proportion of Internet users, the component of the proposed methodology that is based on the correlation with income and education will fade into the background, serving only as a safeguard against non-evidence-based estimations.

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 made more precise. 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 each year. This can be done soon after the UNDP publishes the HDI index at the end of each year.

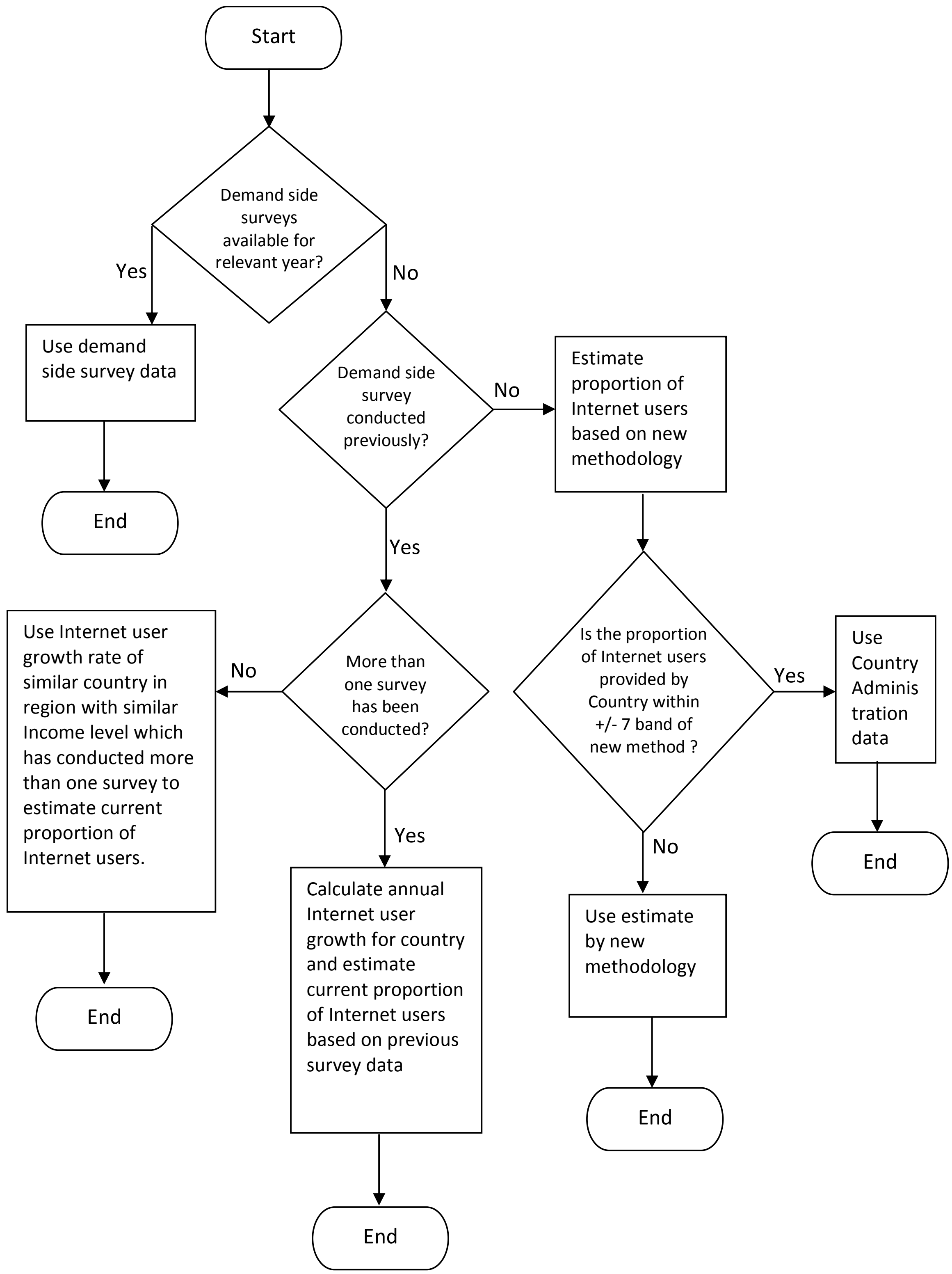

Figure 3 – Flow chart of steps of proposed process for deriving more reasonable estimates of the proportion of Internet Users.
Source: Authors

2.3 The impact of the new methodology on existing proportions 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 users unsupported by evidence. The estimated proportion of individuals using the Internet according to the new method where it is different from the ITU is in Annex 1.

Figure 4 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 several Caribbean Islands, where the ITU figures are around 60 – 80 percent. According to survey data from the Caribbean Islands such as Jamaica (28 Internet users per 100), the average proportion of Internet users is around 20 – 50 percent, which is closer to the Caribbean Islands figures obtained by the new method. Therefore, the new method seems to yield an estimate closer to reality. The ITU and new-method data differ in several African countries, since the RIA data has been included (marked by X)[4].

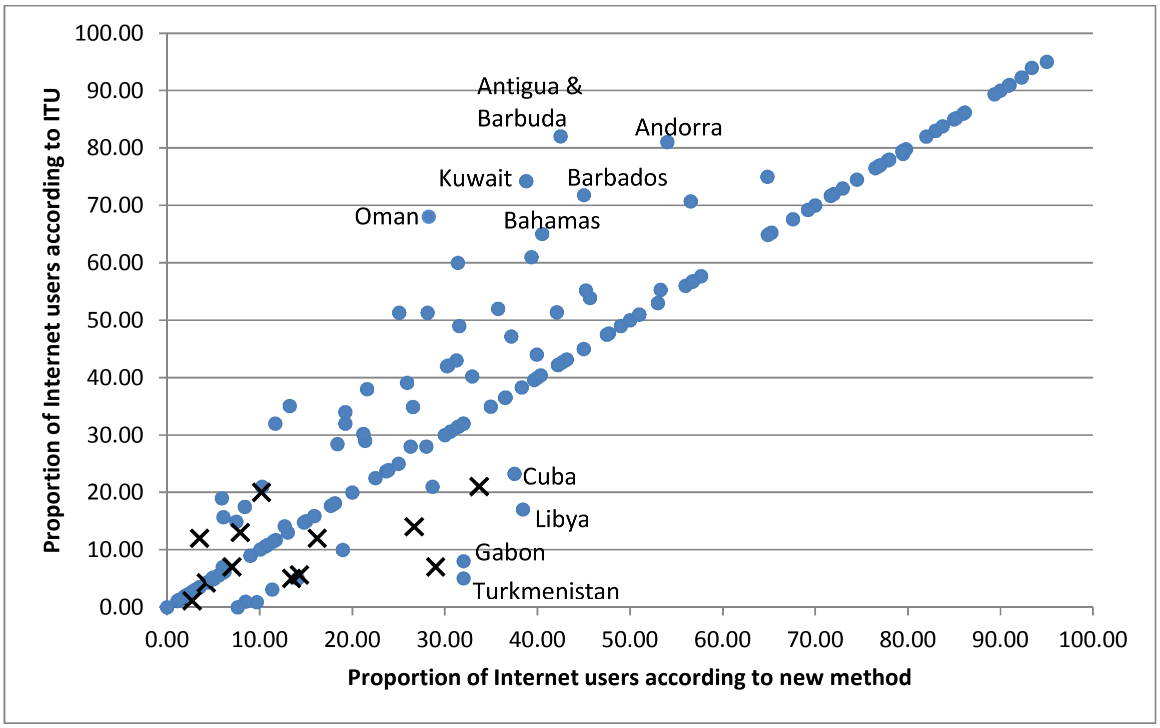

Figure 4 – Comparison between ITU and new-method results.
Source: Authors

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

[4] A weakness in this method is that it seems to over count a few countries such as Cuba, Libya and Turkmenistan which may score very high on income or education level but does not have a corresponding proportion of Internet users. In the case of Cuba it is known that due to censorship and other issues Internet use is low, but this method over-counts it due to the high education level in Cuba. This weakness could be overcome by defining the imputed number as a ceiling, and use country reported data as long as it is less than the estimation. The reason the authors decided to use country reported figures within + or – 7 band was due to the fact that compared to RIA survey data, many African countries seem to be under reporting, as seen from the 'X's in figure 4, It was also seen that when we compared the estimations from the new method with the actual survey results the estimations generally fell within this + or – 7 band.

or regulated entities, known quaintly as “administrations.” Since the reforms of the past three decades,[5] 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 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 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 (LIRNEasia, 2010). In recognition of this, ITU now collects/reports subscriptions, instead of subscribers, as it previously did.

With the ICT sector increasingly beginning to resemble the FMCGs, the old supply-side data dominated indicators have begun to show weaknesses. 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, 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 article suggests an evidence-based alternative methodology to estimate the proportion of individuals using the Internet based on readily available income and education data (components of the HDI). The proposed methodology does not drastically change the proportion of individuals using the Internet of most countries as can be seen from Annex 1. It is intellectually defensible and consistent across countries without demand-side data. It reduces the errors inherent in the present methodology, by bounding government estimations. It also creates incentives for more governments to shift to the first-best method of conducting demand-side surveys.

This methodology operationalizes the principle that demand-side data is first best and therefore suggests including representative survey results from regional research organisations such as RIA. 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 constraints 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.

[5] 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.

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

Country	HDI_EdGNI	New Method	ITU	Variance
Afghanistan	0.373	5.0	5.0	0.0
Albania	0.671	31.6	49.0	-17.4
Algeria	0.636	26.7	14.0	12.7
Andorra	0.783	54.0	81.0	-27.0
Angola	0.484	14.8	14.8	0.0
Antigua & Barbuda	0.733	42.5	82.0	-39.5
Argentina	0.758	47.7	47.7	0.0
Armenia	0.656	32.0	32.0	0.0
Australia	0.906	79.0	79.0	0.0
Austria	0.85	79.8	79.8	0.0
Azerbaijan	0.655	50.0	50.0	0.0
Bahamas	0.723	40.5	65.0	-24.5
Bahrain	0.777	77.0	77.0	0.0
Bangladesh	0.403	5.0	5.0	0.0
Barbados	0.745	45.0	71.8	-26.7
Belarus	0.738	39.6	39.6	0.0
Belgium	0.857	78.0	78.0	0.0
Benin	0.37	3.5	3.5	0.0
Bhutan	0.437	10.3	21.0	-10.7
Bolivia	0.63	30.0	30.0	0.0
Bosnia and Herzegovina	0.67	31.4	60.0	-28.6
Botswana	0.696	29.0	7.0	22.0
Brazil	0.662	45.0	45.0	0.0

Country	HDI_EdGNI	New Method	ITU	Variance
Bulgaria	0.737	51.0	51.0	0.0
Burkina Faso	0.255	3.0	3.0	0.0
Burundi	0.257	1.1	1.1	0.0
Cambodia	0.458	11.4	3.1	8.3
Cameroon	0.474	14.1	5.0	9.1
Canada	0.882	83.0	83.0	0.0
Cape Verde	0.464	11.7	32.0	-20.3
Central African Rep.	0.3	2.2	2.2	0.0
Chad	0.275	1.9	1.9	0.0
Chile	0.748	45.7	53.9	-8.2
China	0.62	38.3	38.3	0.0
Colombia	0.65	40.4	40.4	0.0
Comoros	0.354	5.5	5.5	0.0
Congo	0.506	14.3	5.6	8.7
DR Congo	0.229	5.6	5.6	0.0
Costa Rica	0.663	30.4	42.1	-11.7
Côte d'Ivoire	0.339	2.2	2.2	0.0
Croatia	0.751	56.6	70.7	-14.2
Cuba	0.707	37.5	23.2	14.3
Cyprus	0.794	57.7	57.7	0.0
Czech Republic	0.843	73.0	73.0	0.0
Denmark	0.879	90.0	90.0	0.0
Djibouti	0.364	7.0	7.0	0.0
Dominica	0.647	28.1	51.3	-23.2

Country	HDI_EdGNI	New Method	ITU	Variance
Ecuador	0.652	31.4	31.4	0.0
Egypt	0.564	42.3	42.3	0.0
El Salvador	0.61	17.7	17.7	0.0
Eritrea	0.255	6.2	6.2	0.0
Estonia	0.82	76.5	76.5	0.0
Ethiopia	0.278	2.7	1.1	1.6
Fiji	0.648	28.0	28.0	0.0
Finland	0.852	89.4	89.4	0.0
France	0.844	79.6	79.6	0.0
Gabon	0.674	32.0	8.0	24.0
Gambia	0.349	10.9	10.9	0.0
Georgia	0.682	36.6	36.6	0.0
Germany	0.882	83.0	83.0	0.0
Ghana	0.477	12.7	14.1	-1.4
Greece	0.822	53.0	53.0	0.0
Guatemala	0.484	11.7	11.7	0.0
Guinea	0.276	1.3	1.3	0.0
Guinea-Bissau	0.315	2.7	2.7	0.0
Guyana	0.568	19.3	32.0	-12.7
Honduras	0.539	15.9	15.9	0.0
Hong Kong, China	0.855	74.5	74.5	0.0
Hungary	0.796	65.3	65.3	0.0
Iceland	0.862	95.0	95.0	0.0
India	0.478	10.1	10.1	0.0

Country	HDI_EdGNI	New Method	ITU	Variance
Indonesia	0.55	18.0	18.0	0.0
Iran	0.651	28.7	21.0	7.7
Iraq	0.493	13.4	5.0	8.4
Ireland	0.885	76.8	76.8	0.0
Israel	0.849	70.0	70.0	0.0
Italy	0.827	56.8	56.8	0.0
Jamaica	0.678	31.5	31.5	0.0
Japan	0.855	79.5	79.5	0.0
Jordan	0.635	26.6	34.9	-8.3
Kazakhstan	0.746	45.0	45.0	0.0
Kenya	0.475	26.3	28.0	-1.7
Kiribati	0.565	19.0	10.0	9.0
Korea	0.869	83.8	83.8	0.0
Kuwait	0.714	38.8	74.2	-35.4
Kyrgyzstan	0.556	20.0	20.0	0.0
Lao P.D.R.	0.439	9.0	9.0	0.0
Latvia	0.788	71.7	71.7	0.0
Lebanon	0.697	35.8	52.0	-16.2
Lesotho	0.452	4.2	4.2	0.0
Liberia	0.247	3.0	3.0	0.0
Libya	0.712	38.4	17.0	21.4
Liechtenstein	0.888	85.0	85.0	0.0
Lithuania	0.802	65.1	65.1	0.0
Luxembourg	0.83	90.9	90.9	0.0

Country	HDI_EdGNI	New Method	ITU	Variance
Macedonia	0.668	56.7	56.7	0.0
Madagascar	0.387	1.9	1.9	0.0
Malawi	0.344	3.3	3.3	0.0
Malaysia	0.717	39.4	61.0	-21.6
Maldives	0.568	19.3	34.0	-14.7
Mali	0.306	2.0	2.0	0.0
Malta	0.783	69.2	69.2	0.0
Mauritania	0.391	4.5	4.5	0.0
Mauritius	0.677	35.0	35.0	0.0
Mexico	0.713	37.2	47.2	-10.0
Moldova	0.592	21.6	38.0	-16.4
Mongolia	0.604	10.2	20.0	-9.8
Montenegro	0.73	40.0	40.0	0.0
Morocco	0.489	51.0	51.0	0.0
Mozambique	0.264	4.3	4.3	0.0
Namibia	0.604	16.2	12.0	4.2
Nepal	0.354	9.0	9.0	0.0
Netherlands	0.887	92.3	92.3	0.0
New Zealand	0.885	86.0	86.0	0.0
Nicaragua	0.49	10.6	10.6	0.0
Niger	0.217	1.3	1.3	0.0
Nigeria	0.438	18.4	28.4	-10.0
Norway	0.933	93.4	93.4	0.0
Oman	0.648	28.3	68.0	-39.7

Country	HDI_EdGNI	New Method	ITU	Variance
Pakistan	0.423	9.0	9.0	0.0
Panama	0.716	42.7	42.7	0.0
Papua New Guinea	0.387	2.0	2.0	0.0
Paraguay	0.596	23.9	23.9	0.0
Peru	0.669	36.5	36.5	0.0
Philippines	0.59	21.4	29.0	-7.6
Poland	0.78	64.9	64.9	0.0
Portugal	0.751	55.3	55.3	0.0
Qatar	0.789	86.2	86.2	0.0
Romania	0.748	44.0	44.0	0.0
Russia	0.748	49.0	49.0	0.0
Rwanda	0.376	6.0	7.0	-1.0
S. Tomé & Principe	0.432	10.0	20.2	-10.1
Samoa	0.628	25.7		25.7
Saudi Arabia	0.733	47.5	47.5	0.0
Senegal	0.395	8.4	17.5	-9.1
Serbia	0.724	42.2	42.2	0.0
Seychelles	0.74	43.2	43.2	0.0
Sierra Leone	0.295	0.0	0.0	0.0
Singapore	0.821	75.0	75.0	0.0
Slovak Republic	0.815	79.4	79.4	0.0
Slovenia	0.859	72.0	72.0	0.0
Solomon Islands	0.419	6.0	6.0	0.0
South Africa	0.678	33.7	21.0	12.7

Country	HDI_EdGNI	New Method	ITU	Variance
Spain	0.836	67.6	67.6	0.0
Sri Lanka	0.616	15.0	15.0	0.0
St. Lucia	0.662	30.2	42.0	-11.8
St. Vincent and the Grenadines	0.669	31.3	43.0	-11.8
Sudan	0.322	5.9	19.0	-13.1
Suriname	0.628	32.0	32.0	0.0
Swaziland	0.561	18.1	18.1	0.0
Sweden	0.873	91.0	91.0	0.0
Switzerland	0.865	85.2	85.2	0.0
Syria	0.535	22.5	22.5	0.0
Tajikistan	0.547	13.0	13.0	0.0
Tanzania	0.41	3.5	12.0	-8.5
Thailand	0.61	23.7	23.7	0.0
Timor-Leste	0.425	9.7	0.9	8.8
Togo	0.375	3.5	3.5	0.0
Tonga	0.65	25.0	25.0	0.0
Trinidad & Tobago	0.746	45.2	55.2	-10.0
Tunisia	0.63	25.9	39.1	-13.2
Turkey	0.634	43.1	43.1	0.0
Turkmenistan	0.674	32.0	5.0	27.0
Uganda	0.406	7.9	13.0	-5.1
Ukraine	0.712	30.6	30.6	0.0
United Arab Emirates	0.824	70.0	70.0	0.0
United Kingdom	0.823	82.0	82.0	0.0

Country	HDI_EdGNI	New Method	ITU	Variance
United States	0.903	77.9	77.9	0.0
Uruguay	0.731	42.1	51.4	-9.3
Uzbekistan	0.588	21.2	30.2	-9.0
Venezuela	0.68	40.2	40.2	0.0
Viet Nam	0.49	13.2	35.1	-21.8
Yemen	0.371	7.5	14.9	-7.4
Zambia	0.417	11.5	11.5	0.0
Zimbabwe	0.328	6.1	15.7	-9.6