ICT Development Index – background document

30 September 2019

Introduction

The ICT Development Index (IDI) is a composite index designed to allow assessing and comparing the state of ICT development within and between countries. The IDI allows monitoring changes in the development of ICTs over time so that forward-looking policy can be informed. The IDI was first released in 2009, and since published annually until 2017. The IDI is based on a three-stage conceptual framework aimed to broadly represent the flow of how ICTs contribute to economic and social impacts. In a first stage, ICT infrastructure needs to be in place and it needs to be widely accessible. Second, the infrastructure needs to be used with the effects magnified through the capability (or skills) for effective use. These two stages in turn drive outcomes (third stage). The IDI was therefore grouped into three sub-indices that measure ICT access, ICT use and ICT skills. The development of the IDI followed a standard process encompassing the selection of indicators, imputation of missing data, multivariate analysis, weighting and aggregation, and sensitivity analysis.

The need to continuously improve measurement methods and to update the composition of the IDI in response to technological developments was recognized from the beginning. As broadband and advanced wireless connectivity have become more critical for countries to fully realize the benefits of ICTs, the initial set of indicators needed to be reviewed. To address these issues, in 2016 the ITU launched a process of revising the indicators included in the IDI, through an external consultancy and a subgroup of the Expert Group on Telecommunication/ICT Indicators (EGTI). The results of the two studies were discussed at an Extraordinary Meeting of EGTI and EGH, held in March 2017. The meeting adopted a revised set of indicators to be included in the IDI as of 2018. Table 1 shows the indicators included in the original and the revised IDI.

Table 1: Original and revised indicators for the ICT Development Index (IDI)

Original IDI	Change	Revised IDI
ICT Access		
Percentage of households with a computer	No change	Percentage of households with a computer
Percentage of households with Internet access	No change	Percentage of households with Internet access
International internet bandwidth (bit/s) per Internet user	No change	International internet bandwidth (bit/s) per Internet user
Fixed-telephone subscriptions per 100 inhabitants	Dropped	N/A
Mobile-cellular subscriptions per 100 inhabitants	Dropped	N/A
N/A	Added new indicator	Percentage of the population covered by mobile networks - At least 3G - At least LTE/WiMax
N/A	Added new indicator	Fixed broadband subscriptions by speed tiers as % of total fixed broadband subscriptions - 256 kbit/s to 2 Mbit/s - 2 to 10 Mbit/s - Equal to or above 10 Mbit/s

ICT Use		
Percentage of individuals using the Internet	No change	Percentage of individuals using the Internet
Fixed-broadband subscriptions per 100 inhabitants	Dropped	N/A
Active mobile-broadband subscriptions per 100 inhabitants	No change	Active mobile-broadband subscriptions per 100 inhabitants
N/A	Added new indicator	Mobile broadband Internet traffic per mobile broadband subscription
N/A	Added new indicator	Fixed broadband Internet traffic per fixed broadband subscription
N/A	Added new indicator	Percentage of individuals who own a mobile phone
ICT Skills		
Mean years of schooling	No change	Mean years of schooling
Gross enrollment ratio (secondary level)	No change	Gross enrollment ratio (secondary level)
Gross enrollment level (tertiary level)	No change	Gross enrollment level (tertiary level)
N/A	Added new indicator	Proportion of individuals with ICT skills
11 indicators	**3 dropped indicators, 6 new indicators**	**14 indicators**

IDI 2018

While the extraordinary meeting in 2017 agreed on a revised list of indicators to be included in the IDI going forward, it did not engage in the other methodological steps required for the development and calculation of a composite index (imputation of missing data, statistical analysis, sensitivity analysis, etc., see above). This rather technical work was done by the ITU Secretariat.

After collecting the data for 2018 from Member States, the ITU Secretariat started to develop the methodology to calculate the IDI using the revised set of indicators. However, this did not come to a fruitful conclusion. For a number of reasons, the IDI for the year 2018 based on the revised set of indicators could not be calculated and released. These reasons were communicated in Circular SG/BDT/010, sent on 5 December 2018, and during the 16th World Telecommunication/ICT Indicators Symposium (WTIS), held from 10 to 12 December 2018 in Geneva. The reasons are explained in more detail in the sections below.

a. Quantity of data received

An important reason for not publishing the IDI 2018 was the low data availability. Only 42 per cent of all data points required to calculate the IDI would be based on data submitted by countries, requiring ITU to estimate 58 per cent of data points. For the new indicators included in the revised set, 77 per cent of data points were not available (against 34 per cent for the indicators kept from the original set). For some of the new indicators it was very difficult to make reliable estimates, e.g. for the ICT skills and traffic indicators. It is against best practice in index construction to base results on such a large number of estimates. Member States have also clearly indicated that they prefer to limit the amount of estimates in the index.

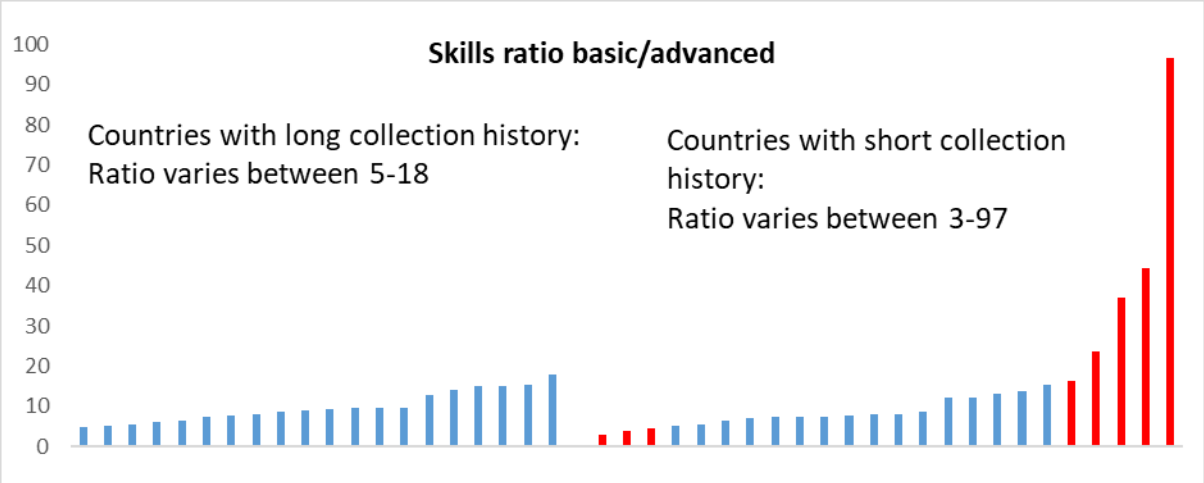
b. Data quality

The verification of the collected data also revealed that some of the data submitted by countries were not in line with ITU's agreed methodology resulting in the data not being sufficiently harmonized. Indicators such as fixed-broadband Internet traffic and individuals with ICT skills were not mature enough

yet to be included in the IDI, as emphasised by the fact that these indicators have subsequently been subject to further discussions by EGTI and EGH.

For example, the indicator "Proportion of individuals with ICT skills" is based on nine activities that people carry out on a computer[1], which can be aggregated into three categories: basic, standard and advanced skills. Normally, more people will have carried out activities in the basic skills category than in the advanced skills category. In countries that have collected skills data already for a significant number of years, the ratio between the proportion of individuals with basic and advanced skills varies from 5 to 18. In countries that have only recently started to collect these data, the spread of this ratio is much larger, from 3 to 97. This wider spread is more likely to be an artefact of the data collection than reflecting the real situation in these countries (see Chart 1).

Chart 1: Ratio of individuals with basic and advanced skills



Source: ITU

c. Indicator selection

As highlighted in the OECD *Handbook on Constructing Composite Indicators* (2008)[2]: "Index construction is normally a long and iterative process of selecting indicators that are widely available for many countries and that best fit the index framework and then testing them and retaining those that have explanatory power. Creating an index is thus as much about art as science. The 'composite index builder' requires deep understanding of the subject matter as well as statistical techniques."

When the ITU Secretariat started the methodological work related to the revised indicator set, including checking for the availability of data, testing the indicators for their fit with the conceptual framework and conducting a sensitivity analysis, a number of issues appeared which illustrated the flaws that occurred in the process of revising the indicators included in the IDI.

One example is the newly added indicator "Fixed broadband by speed tiers". To illustrate the problem, a country with a total of 10 fixed-broadband subscriptions, all at high speed (> 10 Mbps), would score 1 out of 1 (perfect score) for that indicator, while a country with 10 million fixed-broadband subscriptions, but only half at the highest speed and half between 2 and 10 Mbps, would have a score <1 for that indicator. This would be an incorrect reflection of the actual ICT development for fixed-broadband in those two

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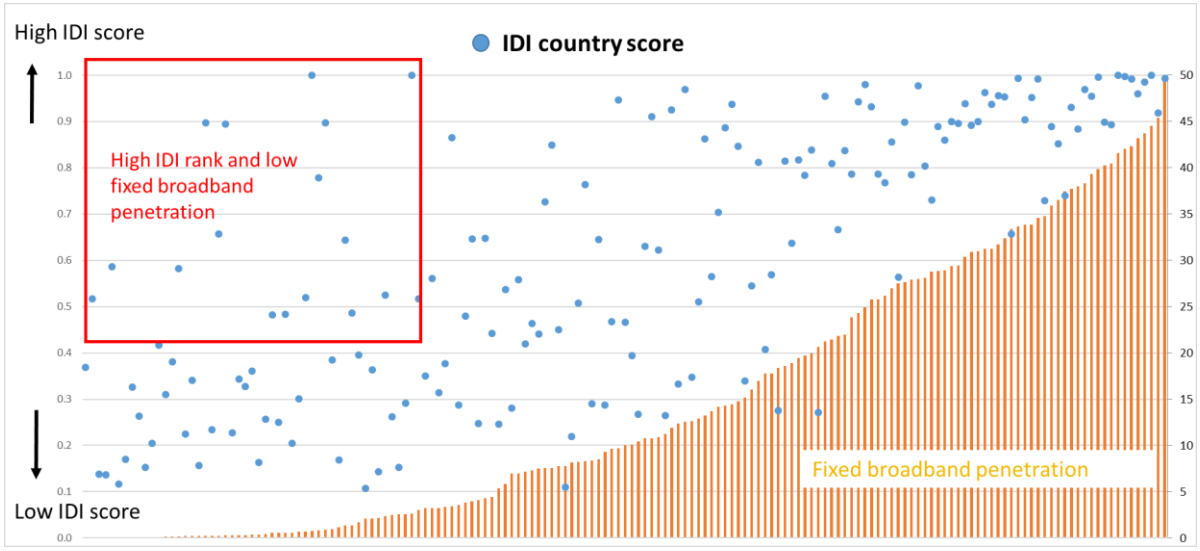
[1] This indicator has subsequently been revised by the Expert Group on Households, and now consists of 11 activities carried out by individuals during the last three months, independent of the (digital) device(s) used.

[2] See https://www.oecd.org/sdd/42495745.pdf.

countries.[3] Chart 2 shows that there are many countries, which would score high on this indicator, despite a low number of fixed-broadband subscriptions.

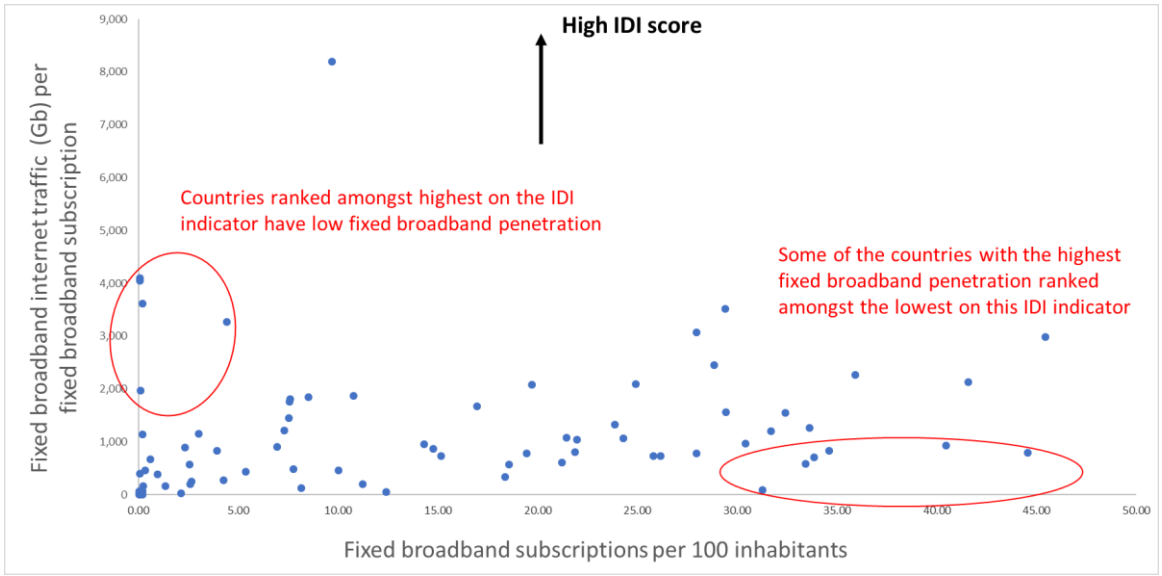
Chart 2: Fixed broadband by speed tier score vs. fixed-broadband penetration



Source: ITU

Another example is the newly added indicator "fixed-broadband traffic per fixed broadband subscription". By using the number of fixed-broadband subscriptions as denominator, a country with only a few fixed-broadband subscriptions, but which are all intensive data users[4], would score higher than a country with millions of fixed-broadband subscriptions with a less intensive data usage. Chart 3 shows that there is a group of countries with a low number of fixed-broadband subscriptions that would score high on this indicator, whereas there is another group of countries with a large number of fixed-broadband subscriptions that would score very low on this indicator. This also would not be a true reflection of the level of ICT development in these countries.

Chart 3: Fixed-broadband traffic per fixed-broadband subscription vs. fixed-broadband penetration



Source: ITU

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[3] In particular because many popular video and audio streaming applications operate adequately with bandwidth of less than 5 Mbps, therefore speeds of 2 to 10 Mbps are in most cases sufficient for a normal usage pattern.

[4] Often these are businesses, which have a higher data usage than households.

IDI 2019

After collecting and verifying the data in 2019 for reference year 2018, it was found that, despite two rounds of capacity building workshops in all the regions, the amount of data received for the revised set of IDI indicators did not improve significantly.

In addition to the problem of data availability, the issues highlighted above on the flaws related to the selection of indicators persist. For these reasons, the ITU Secretariat is not in a position to produce and publish the IDI using the revised set of indicators.

For 2019, it is therefore proposed to publish the IDI using the original set of indicators, for the following reasons:

- Publishing the IDI on an annual basis is part of the mandate of ITU, cf. Resolution 8 of the WTDC and Resolution 131 of the Plenipotentiary conference.
- Many countries have requested ITU to publish the index again, even using the original methodology.
- Countries use the IDI to track their performance – not publishing it a second year in a row will impose a problem for these countries.
- Using the original methodology has as additional benefit that the results for 2018 can also be calculated; it will also guarantee comparability across the previous ten years.
- There is a confirmed quality of the data and the index is statistically coherent and robust.
- Several other international agencies are using the ITU IDI (based on the original methodology) in their own work and publications, such as WIPO's Global Innovation index, and UN's E-government index.

Therefore, the ITU Secretariat recommends to publish the IDI 2019 based on the original methodology, rather than not publishing it at all. Recognizing that some of the indicators are outdated, this would only be a temporary measure. A process will be launched to develop a new index for 2020, which will include a wider consultation with relevant experts from ITU members, the global statistical community, academic institutions, and the Partnership on Measuring ICT for Development.

Conscious of the fact that there are a number of countries that are opposed to publishing the IDI using the original methodology, a consultation with all Member States is being conducted on this matter.