

Analysis instead of summation: Why indices are not enough for ICT policy and regulation

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Abstract:

This paper demonstrates that analysing ICT indicators, based on benchmarking through the application of a dynamic diagnostic approach with context relevant indicators, provides a far more valid evidence-base for ICT policy and regulation than using the ranking of a country on one of the global ICT indices. Both approaches - composite indices and benchmarking - use the same data but differ in how the data is analysed. Both approaches have shortcomings. However, the benchmarking approach used in this paper is seen as the starting point for further analysis, showing clearly the linkages between individual indicators. Global ICT indices, as they are currently formulated, disguise these linkages by providing a composite measure, encouraging the perception that the index is the end result of the analysis, rather than the beginning. Ranking all countries, from poorest to the richest, leads to an automatically high correlation of an index to GDP per capita, making the latter the best predictor for the index score.

Introduction

Global ICT indices (or rankings) have never been more popular. Some of those most widely promoted currently include the World Economic Forum's Network Readiness Index (NRI)¹, the ITU's ICT Development Index (IDI)², the World Bank's Digital Adoption Index³, the Alliance for Affordable Internet's Affordability Drivers Index (ADI)⁴, the World Wide Web Foundations Women Rights Online Index and GSMA's Mobile Connectivity Index⁵. The latest addition is the Inclusive Internet Index (3i) from the Economist Intelligence Unit, launched in collaboration with Facebook this year.⁶

Global ICT indices are compelling because they allow multilateral organisations, like the ITU or World Bank, to produce indicators for member states to assess their progress against their proposed policies or so-called 'best practice' by competing against each other in the rankings. They are compelling for lobby groups and industry forums, such as such as the GSMA and the World Economic Forum (WEF), multinational organisations and global platforms such as Facebook, because they provide seemingly simple, generalised answers across countries to complex, often context-specific problems.

¹ WEF, Global Competitiveness Report 2015/16, available at <http://reports.weforum.org/global-competitiveness-report-2015-2016/>

² ITU, World Development Index 2015, available from <http://www.itu.int/net4/ITU-D/idi/2015/>

³ <http://wbgfiles.worldbank.org/documents/dec/digital-adoption-index.html>

⁴ <http://a4ai.org/affordability-report/>

⁵ <http://www.mobileconnectivityindex.com>

⁶ <https://theinclusiveinternet.eiu.com/summary>

The intention of global ICT indices to show a composite measure effectively disguises the individual indicators that make up the index, concealing the linkages between indicators as well as the selection of indicators. For example, the inclusion of fixed broadband subscriptions as a measure of internet access is not a helpful indicator in Africa, where penetration is a fraction of one percent.⁷

The answers provided by composite ICT indices, as they are currently compiled, are at best, indicative of movements of countries towards generalised attainable goals, though without any causal explanations. Worse, based on assumptions not pertinent to developing countries, together with the absence or patchiness of data in developing countries and the bias of single or even double 'expert reviews' of country assessments used in several of the indices, the answers provided by these indices may simply be statistically inaccurate or ideologically biased in their subjective assessment. This means that far from contributing to sound evidence-based policy in developing countries they misinform, send the wrong signals, perpetuate poor policy or propose incorrect policy fixes.

Powerful epistemic communities have developed around these indices that leave them largely unchallenged intellectually and, in the absence of alternatives, the default reference points for governments, regional economic communities, UN and other multilateral agencies and aid and donor organisations. In at least one instance where statistical audits have been conducted, the audit commits some of the same mistakes of the index, such as accepting the inclusion of indicators that have no relevance to developing countries.⁸ An ITU index that merely serves policy makers and regulators of rich nations is clearly not in the interest of global inclusion and reducing the digital divide.

It might be assumed that the plethora of indices provides a diverse range of perspectives for stakeholders. But common to these indices are 'best practice' models generally based on assumptions about competitive, effectively regulated markets, capacitated institutions and high technological absorptive capacity. While broadly indicative for most countries (especially developed countries with complete data sets), the lack of data or understanding of the context of developing markets, can misinform or incorrectly signal to policy makers and regulators.

Further, while these indices all focus on different aspect of the 'digital divide' because they are all global indices they are dependent to different degrees on the ITU for comparative data, which is dependent on member states and is uneven.

This paper argues that global ICT indices are less useful than the primary indicators they are using because of the following factors:

- They encourage simplistic, non-causal explanations.
- Changes in index ranking may have nothing to do with the ICT sector. For example, GDP per capita explains 85% of the variation in the index rankings from the EIU's 3i. The drop in oil prices in the last few years have benefited some countries and harmed economic growth of oil producing countries such as Brazil, Venezuela, Nigeria and Angola. GDP per capita is not something ICT regulators and policymaker can influence.
- Global ICT indices use definitions that are too broad, or applicable to the developed world only (Lall, 2001).
- The conceptual frameworks used to inform many indices are typically based on loose association instead of economic theory or empirical evidence.
- Indices are mostly a simple addition of indicators, thus implying equal weights, while some factors are clearly more important than others. The ITU's IDI, for example, ranks all indicators in each of its three sub-

⁷ The ITU has capped fixed broadband subscriptions at 60% penetration but this misses the point: fixed broadband penetration as a measure of internet access is irrelevant in Africa, regardless of whether it is capped or not.

⁸ See, for example, Saisana and Dominguez-Torreiro (2015).

indices equally. It then weights its three sub-indices.

As these indices move beyond simple access indicators to intensity of use and human capacity for use, the data become increasingly dubious. Much of this kind of data can only be ascertained from demand side surveys which are undertaken in very few countries. Trying to deal with some of these complexities by meshing quantitative supply and demand side data with expert assessments creates methodological and rigour issues.

Surprisingly few efforts have been made to critique the ITU indices over the years (see Hanafizadeh, et al, 2009). Even those that have attempted to enhance them acknowledge their deficiencies by accepting their underlying premises.

Dobrota, et al (2015), point to its bias and uncertainty. They nevertheless move from the premise that “..the (ITU) index uses core ICT indicators on which the international community and experienced modellers have consensus that they measure the information society suitably.” The proliferation of these indices and the lack of rigour and utility for policy formulation demonstrated in this paper suggests that indices may only be appropriate as tools to stimulate national debate and provide incentives to collect data.

This paper contributes to the discussion of aggregators vs non-aggregators⁹, by arguing that benchmarking of individual ICT indicators has more analytical power than indices for the purpose of establishing baselines and identifying policy or regulatory interventions required to remedy barriers to ICT penetration in specific countries. Benchmarking requires the user to make a choice of countries to benchmark against and, depending upon the selection of countries, the comparison of an indicator may change from favourable to unfavourable.

A nationally composite picture based on relevant metrics in relation to countries with similar conditions, though not necessarily similar outcomes, is far more likely to identify the exact points of policy and regulatory intervention in that particular context.

Further, national progress is more meaningfully determined by the progress of a country over time, measured against a set of relevant indicators or comparator countries, than on a global ranking that might, in the first instance, not really be assessing the right things or whose rank on the index may well be determined by what other countries have done or not done on that set of measures.

The paper uses the mAccess Diagnostic Tool - developed by Research ICT Solutions - to illustrate how to benchmark a country effectively with a set of indicators that link policy and regulatory objectives to outcomes. The interlinked indicators of affordability, access, usage, infrastructure and competition enable the identification of regulatory intervention points for the ICT sector.

Constructing Indices

Indices are useful to aggregate and analyse information. Successful examples of widely used indices are stock market indices and consumer price baskets. The OECD (2010) price baskets are a good example for indices relevant to ICT policy makers and regulators.

ICT policy makers and regulators want to know what practical interventions can be made that are within their authority. They specifically want to know where the bottlenecks are in the market. This information is a crucial input into what policy options are available to overcome the specific bottleneck.

⁹ Aggregators believe that there is value in combining indicators to generate a headline figure to stimulate media attention and as a result interest of policy makers. The non-aggregators do not see value in the arbitrary weighting process by which the variables are combined OECD (2008).

This requires a coherent conceptual framework that informs the selection of indicators and provides a logical narrative for each country's scores. The lack of a coherent framework leads to poor selection of indicators and the arbitrary weighting of these indicators. It may also give undue weight to factors such as GDP per capita.

The OECD/JRC (2008) Handbook on Constructing Composite Indicators provides detailed guide on how to construct indices. In its introduction, it states that indices should be seen as a means of initiating discussion and public interest amongst its target audience. In the case of ICT indices, the target audience ought to be ICT policy makers and regulators, though of course, transparent to all stakeholders.

The next section summarises each step in the OECD/JRC (2008) handbook and discusses how they relate to ICT indices that are currently being generated.

Step 1: Theoretical framework

The theoretical framework informs the indicator selection, the construction of sub-indices, the weighting and the target audience. Global ICT indices, by trying to appeal to as wide an audience as possible, run the risk of supplying generic information to expert audiences.

Policy makers and regulators are grappling with how to deal with new services and the impact these might have on ICT access and usage. They also have to react to changes in market structure and attempts to limit competition by licensees.

Simple indices like a building cost index may use a very simple framework based on a common input cost, all expressed in monetary terms. This kind of index is useful because it is targeted at a specific group and has a clear purpose. Also, changes in the index can be traced back to observable changes in input costs.

The theoretical framework also helps to separate cause and effect. An index component should not include indicators that affect the same outcome that an index component is intended to measure. For example, market concentration indicators and price indicators should not be combined. Market concentration has an impact on price. One could use market concentration for an input index that explains prices in a country or one could simply use prices directly, which would be an output index in this application.

The theoretical framework is also important to conceptually separate primary and secondary factors, or direct and indirect impact factors. When measuring mobile broadband adoption, for example, primary indicators could be:

- Price of prepaid mobile broadband data
- 3G/4G network coverage
- Smartphone penetration

An index out of these three indicators would perfectly explain mobile broadband uptake and help policy makers to identify where to look next if progress is unsatisfactory. Low smartphone penetration could be addressed by reducing import duties while better 3G/4G coverage requires more sophisticated regulatory tools.

Secondary factors may include educational indicators, inequality in income distribution and so forth. Combining primary and secondary indicators, based on a poorly defined conceptual framework such as the GSMA's MCI of 2017 loses usefulness for policy makers and regulators.

Step 2: Data selection

The indicator selection depends on timelines and accuracy of data available, and relevance related to the phenomenon that is being measured. Proxy variables are sometimes used when data is not available.

School enrolments as a proxy for ICT skills is an example. It is important to analyse proxy indicators and establish whether there is a link to the data it is meant to represent. The EIU's 3i uses, as a proxy for local content, an indicator based whether news websites exist for all official languages in a country.

Table 1: Proxy Indicators Local Content	
Index Points	Does the country have any domestic news websites that provide information online in the official language(s)?
0	Mali
1	Algeria, Colombia, Guatemala, Senegal, Seychelles South Africa,
2	other 68 countries

This indicator has the value 0 for no news website in official language, 1 for news websites in at least one official language and 2 for news websites in all official languages. Mali is the only country that scores a 0. However a quick internet search indicates that this is wrong (<http://www.lesechos.ml>). Most countries only have one official language and thus score the highest value of 2. South Africa, however, has 11 official languages and gets penalised in the ranking for it whereas it should have received an extra bonus point. This is an example of a failed proxy variable for local content availability:

- a) There is no variation for the vast majority of countries, 68 have maximum value of 2
- b) South Africa, a country that actively promotes and constitutionally protects local languages is penalised in the index.
- c) The data is not accurate.
- d) The proxy indicator is not linked to what it is supposed to represent: local content.

ICT Policy makers and regulators are unlikely to pick up such detail, which imposes an even higher responsibility for the creators of indices to make the right input choices.

Step 3: Imputation of missing data

Imputations may be used to estimate missing values. The alternative is to exclude countries from the index that have missing values. The latter is rarely a choice for indices built by UN institutions such as the ITU and the consequence is that the overall index suffers in terms of accuracy. The extent of imputation is also of importance, whether 30-40% of missing data is imputed or just 1-5%.

One of the main challenges for global indices is incorporating demand side indicators, i.e., household survey based indicators. Surveys are infrequent, not every year, and often only available for few countries. Imputation then stretches across time and countries, such as the ITU's IDI, which uses household level indicators, leading to low levels of accuracy, especially for developing countries.

Step 4: Multivariate analysis

The multivariate analysis assesses the suitability of indicators for the index and sub-indices and informs the weighting. Indicators should, for example, not be combined into an index because they measure the same topic. If several indicators measure the same thing, one should only include one, or apply weights to correct for the correlation.

Saisana and Dominguez-Torreiro (2015) provide an example of the latter in their recommendation that the ITU's IDI halve the weight for indicators like percentage of households with a computer and percentage of households with Internet access.

Factor analysis, principal components analysis, cluster analysis and internal validity tests using Cronbach's alpha may be used to identify linkages between indicators.

For global ICT indices, a common problem is that several proxy variables are highly correlated to per capita GDP, which means that GDP per capita has an excessive weight in the index (see Table 2).

Index	Index Name	Institution	Linear	Exponential
3i	Inclusive Internet Index	EIU	0.55	0.85
NRI	Network Readiness Index	WEF	0.65	0.82
IDI	Internet Development Index	ITU	0.55	0.85
ADI	Affordability Drivers Index	A4AI	0.46	0.54
MCI	Mobile Connectivity Index	GSMA	0.52	0.88

This is a natural consequence of global ranking, with rich and poor countries being measured by the same indicators.

Step 5: Normalisation

Normalisation is a procedure to transform indicators of various types (percentages, currencies, absolute values) to a common scale. Procedures include ranking, percentage of annual differences over consecutive years, taking values above or below the mean, transformation into categorical scales and distance to a reference country. The suitable normalisation procedure results from the theoretical framework.

While normalisation is important for building indices, normalised indicators are not easy to understand for policy makers and regulators. GSMA lets a user explore the underlying indicator of the index only in normalised form, for example, while the World Bank's ADI10 displays the actual indicators, which is much more useful.

Step 6: Weighting and Aggregation

Building an index implies weighting each indicator. This weighting may be explicit, such as the EIU's 3i or the ITU's IDI sub-indices or implicit like for the individual indicators that are used in the ITU's IDI. Indices that do not specify weights means that an equal weighting is applied for each indicator.

Weights can be based on importance of an indicator or can be used to correct for correlation issues between indicators. Ideally, weights are based on an understanding of the indicators and their impact on the outcome to be measured and, in turn, need to be informed by the theoretical framework.

In terms of aggregation it is important to avoid building index components based on loose association. Combining fixed line and mobile access indicators into one sub-index disguises the meaning and limits the usefulness of the index, even though both indicators measure "Access". Fixed line penetration in Africa is closely related to GDP per capita and penetration is a fraction of mobile. Combining these indicators, especially without realistic weighting, results in a bias towards a country with a higher GDP per capita.

Several global ICT indices have started to include measures other than access or connectivity and this is a positive development. Demand side data available for Africa (Schmidt and Stork, 2008; Deen-Swaray, Gillwald, Morrell, Khan, 2012 revised 2016) shows human development factors to be a primary determinant of peoples' ability to use ICTs optimally and indeed of digital inequality more broadly. This is also borne out in the theoretical literature (DiMaggio, Hargittai, Celeste & Shafer, 2004; Castells and Himanen, 2013). However, including indicators that are highly correlated to GDP per capita to the connectivity indicators that are already highly correlated to GDP per capita only amplifies the impact of GDP per capita on results, unless weights are being used to compensate for the common factor.

¹⁰ <http://wbfiles.worldbank.org/documents/dec/digital-adoption-index.html>

Step 7: Sensitivity Analysis

A sensitivity analysis looks into variation in index scores for variations in the index parameters. That can be for inclusion or exclusion of selected indicators or choices in normalisation procedures, weighting and to deal with missing data. It helps to fine tune the link between the index or sub-indices to the phenomenon that it is supposed to be measured.

Step 8: Back to the Data

Once the first reliable set of index values is calculated, the index needs to be tested against the conceptual framework. A first step could be to compile country profiles and check whether they tell the right story based on the index and sub-indices. A second test would be to see if changes in the index, increases or decreases, are reflected in real changes in the ICT sector and whether those can be linked to policy and regulatory initiatives.

Step 9: Links to other Indicators

Regression analysis can be used to measure links of the index to other indicators, which are not included in the index. This could be unrelated to the phenomenon measured by the index or from another data source. An affordability index could be measured against price baskets (which indices by themselves).

Step 10: Visualisation of the results

Visualisation of ICT indices is a common strong point and it seems that a substantial part of the budget is spent on getting results out to the media and policy makers. The most important part is the ability of the end user to interpret the results and inspect that data.

Summary

There are many examples of good indices that meet all of the above factors listed in the OECD/JRC handbook, such as the World Bank's Ease of Doing Business Index¹¹:

- It has a clear target audience: country authorities that have an impact on the regulatory environment for doing business.
- The WB DBI doesn't use overlapping indicators and doesn't cover all regulations or regulatory requirements in a country, only the ones that have an impact on their specific subject: the ease at which firms can start and conduct business in the country.
- The Index is based on simple averages between indicators, with few weights.¹²
- There is a clear objective: how to reduce the regulatory burden that a firm faces in a country. The Index is not concerned with competition but only the regulatory burden.

Other successful indices include OECD price baskets (OECD 2010) and consumer pricing indices. A successful global ICT index would need a set of core objective that are measured and a clear target audience. But more importantly, it would need to indicate policy or regulatory success in one way or another and not just be a reflection of GDP per capita. The next section analyses how far ICT indices measure up against the OECD guidelines.

¹¹ Available at <http://www.doingbusiness.org>

¹² See http://siteresources.worldbank.org/EXTAFRsumaftps/Resources/db_indicators.pdf

Indices for ICT Policy and Regulation

This section analyses the suitability of current ICT indices for ICT policy makers and regulators, specifically the World Economic Forum's Network Readiness Index (NRI), the ITU's ICT Development Index (IDI), the Access for Affordable Internet's Affordability Index (ADI), the GSMA's Mobile Connectivity Index (MCI) and the Economist Intelligence Unit's Inclusive Internet Index (3i). From a policy or regulatory point of view, there are three criteria for an index to be useful:

- A change in an index value reflects progress or regress. Policy makers and regulators must be able to use index values to monitor the health of the ICT sector or a sub sector.
- Changes in index rankings shows which countries improved their ICT sector performance disproportionately and can be studied to establish best practice.
- The index and sub indices identify potential bottlenecks to improve ICT sector performance.

For each index we first discuss the conceptual framework. Then we analyse how indices compare to some common ICT and economic indicators like active SIM card penetration and GDP per capita. As third step we analyse in how far affordability sub-index scores are related to current prices for mobile prepaid voice and data for Africa, Latin America and South and South East Asia.

World Economic Forum's Network Readiness Index

The WEF's NRI conceptual framework is based on three main drivers: Readiness, Environment and Usage, as shown in Figure 1:

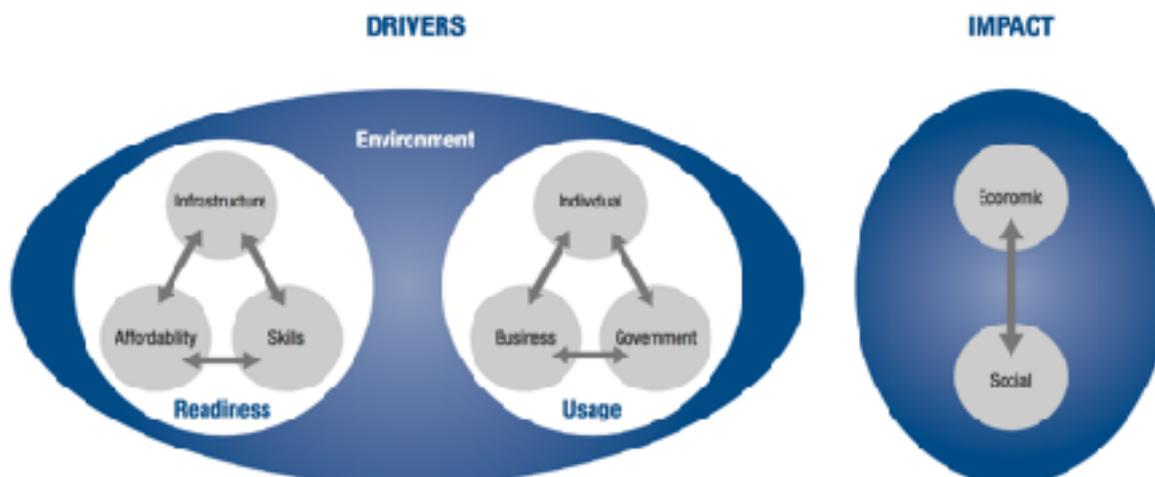


Figure 1: WEF's NRI conceptual framework (WEF, 2016, page 5)

According to the WEF's conceptual framework, readiness and usage are linked by the environment, i.e., the political and regulatory environment and the business and innovation environment. Usage is determined by political and regulatory factors and not price. Skills are determined by environmental factors and not by usage or affordability. The WEF is correct that policy and regulatory factors play a role, but its conceptual framework forgets, for example, to directly link affordability and use. More important, the insistence that all factors interact equally on each other (within their bubbles) means that the identification of an obstacle to improved access and usage is impossible. As a schematic of the interaction of elements of the ICT ecosystem, the WEF's theoretical framework is incomplete. Table 3 is an overview of key elements of the WEF's NRI.

Objective	Assess countries' ability to capitalise on the digital revolution and their preparedness to benefit from the emerging Fourth Industrial Revolution
Target Audience	Policy makers in each country
Conceptual framework	Networked readiness rests on whether a country possesses the drivers necessary for digital technologies to unleash their potential, and on whether these technologies are actually impacting the economy and society.
Weighting	Indicators are generally given equal weighting (using the arithmetic mean to aggregate individual indicators). Some exceptions to this rule exist.

The WEF's NRI consists of 10 pillars, shown in Table 4. The incomplete conceptual framework means that the wrong indicators have been selected for several of the pillars. Under the affordability pillar, for example, there are three indicators: prepaid mobile cellular tariffs, fixed broadband internet tariffs, and the Internet and telephony sectors competition index, which is a composite index measuring the degree of liberalisation in 17 categories of ICT services. It is immediately clear that a key piece of information is missing: mobile broadband tariffs, which is especially important because this is how the vast majority of Africans gain access to the Internet.

At the same time, the Affordability sub-index mixes together cause and effect, competition and price, making it difficult to interpret.

Sub-indices	Pillars	Number of indicators
Environment subindex	Political and regulatory environment	9
	Business and innovation environment	9
Readiness subindex	Infrastructure	4
	Affordability	3
	Skills	4
Usage subindex	Individual usage	7
	Business usage	6
	Government usage	3
Impact subindex	Economic impacts	4
	Social impacts	4

Table 5 compares the WEF's NRI to a selection of basic indicators ranging from price to access. The second column lists the R^2 value, showing how closely the WEF's NRI rankings are fitted to the regression line for the selected ICT indicator. The R^2 for the NRI score against GDP per capita is between 0.65 to 0.82, depending on whether a linear or exponential trend line is fitted. This shows that GDP per capita explains most of the variation in index scores. Interestingly, the overall score of the NRI tracks prices expressed as share of GDP per capita better than the NRI's affordability pillar. This is due to the GDP per capita influence. Mobile internet users per 100 inhabitants is the second strongest correlation and the NRI scores a R^2 of 0.7.

	NRI R^2	4th Pillar Affordability
GDP per Capita: Linear	0.65	0.06
GDP per Capita: Exponential	0.82	0.18
Active SIM per 100 inhabitants	0.27	0.09
1GB Basket USD	0.0282	0.0811
1GB Basket % GDP per Capita: Linear	0.35	0.23
1GB Basket % GDP per Capita: Exponential	0.58	0.28
OECD 30 calls 100 SMS basket in USD	0.01	0.17
OECD 30 calls 100 SMS basket in % GDP per Capita: Linear	0.44	0.28
OECD 30 calls 100 SMS basket in % GDP per Capita: Exponential	0.62	0.32
Landlines per 100 inhabitants	0.62	0.16

Table 5: R ² NRI link to other indicators	NRI R ²	4th Pillar Affordability
Mobile Internet users per 100 inhabitants	0.70	0.16

The incomplete theoretical framework, the exclusion of key data such as mobile broadband prices, the lack of a clear rationale for weighting indicators, and the weak R² values for actual prices results in some bizarre rankings. Table 6 shows the overall NRI ranking alongside the Affordability ranking (pillar 4) and compares these rankings to the basket values for voice and SMS (OECD basket) and internet (1GB prepaid mobile broadband).

Table 6	WEF NRI 2016 RANK out of 152		Research ICT Africa Q4 2016 in USD			
			OECD basket (30 calls, 100 SMS)		1GB prepaid mobile broadband per month	
	NRI	Affordability (Pillar 4) Ranking	Cheapest in Country	Cheapest from dominant MNO	Cheapest in Country	Cheapest from dominant MNO
South Africa	65	74	3.59	5.74	7.12	10.71
Kenya	86	102	2.35	2.68	5.00	5.00
Namibia	99	119	3.97	3.97	5.89	5.89
Ghana	102	105	2.04	2.68	2.46	4.92
Africa	111	103	7.31	7.98	9.24	10.14
Zambia	116	129	6.11	6.11	13.25	13.25
Uganda	121	117	1.43	5.73	3.44	10.03
Tanzania	126	131	3.74	3.74	2.99	4.21

- Tanzania is ranked by the NRI below the African average but has some of the lowest voice and data prices in Africa.
- South Africa is ranked the best amongst the selected countries, well above the African average, even though all other countries, except Zambia are cheaper for mobile voice and data.

In summary, the WEF's NRI is closely correlated to GDP per capita and it doesn't correctly rank affordability and therefore it can't meet its objective to "Assess countries' ability to capitalise on the digital revolution and their preparedness to benefit from the emerging Fourth Industrial Revolution" (WEF, 2016, page 5).

International Telecommunication Union's Internet Development Index (IDI)

The ITU's IDI has three sub-indices: ICT readiness, ICT use and ICT capability. According to this framework, ICT readiness and ICT capabilities are the precursor to ICT use. ICT use is determined by both readiness and capacity (i.e. skills), as shown in Figure 2:

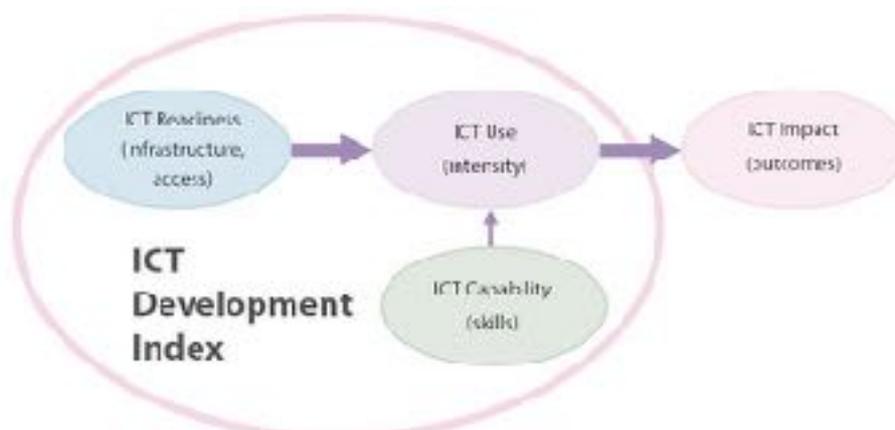


Figure 2: ITU's IDI conceptual framework (ITU, n.d.)¹³

¹³ <http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2016/methodology.aspx>

1. ICT readiness sub-index includes five infrastructure and access indicators (fixed-telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, households with a computer, and households with Internet access).
2. ICT capabilities sub-index captures skills which are important for ICTs. It includes three proxy indicators (mean years of schooling, gross secondary enrolment, and gross tertiary enrolment).
3. ICT Use sub-index captures ICT intensity, and includes three intensity and usage indicators (individuals using the Internet, fixed broadband subscriptions, and mobile-broadband subscriptions).

The index ignores the role of affordability and its relationship with usage. It also uses subscriber numbers for access and usage indices:

- ICT Use: fixed broadband subscriptions, and mobile-broadband subscriptions
- ICT Readiness Access: fixed-telephone subscriptions, mobile-cellular telephone subscriptions

Table 7: Overview of reviewed indices (ITU)	
Objective	To monitor and compare developments in information and communication technology (ICT) between countries and over time. To measure the development potential of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.
Target Audience	Policy Makers
Conceptual framework	Infrastructure and ICT skills are preconditions for ICT use and ICT use results in ICT impact.
Weighting	The three sub-indices are weighted as follows: 40% ICT Access, 40% ICT use, 20% ICT skills Indicators within the sub-indices are weighted equally.

The ITU's Readiness / Access component also uses household indicators for computer ownership and Internet access. These two indicators are based on household surveys and not globally available and so access figures for many African countries would have to be estimated, leading to significant bias in the results.

Table 8: R ² ITU IDI link to other indicators	IDI 2016	Access	Use	Skill
GDP per Capita: Linear	0.55	0.54	0.60	0.33
GDP per Capita: Exponential	0.85	0.84	0.82	0.68
Active SIM per 100 inhabitants	0.39	0.45	0.35	0.26
1GB Basket USD	0.0001	0.0001	0.0005	0.0005
1GB Basket % GDP per Capita: Linear	0.38	0.38	0.31	0.35
1GB Basket % GDP per Capita: Exponential	0.64	0.63	0.55	0.56
Landlines per 100 inhabitants	0.72	0.75	0.65	0.61
Mobile Internet users per 100 inhabitants	0.78	0.78	0.76	0.59

Table 8 links the ITU's IDI to a selection of basic indicators ranging from price to access via R² values. Similar to the NRI, the IDI mostly tracks GDP per capita (R² of 0.85). Landlines per 100 inhabitants also score highly given that this indicator is also highly correlated to GDP per capita. Surprisingly, it is not only the overall index score that is highly correlated to GDP per capita but even every single sub-index.

Table 9	ITU IDI 2016 RANK out of 175				ITU 2016	GSMA Q4 2016
	Overall	Access	Use	Skills	Active Sim per 100	MOU
South Africa	88	90	79	79	155	137.3
Ghana	112	105	103	120	128	142.5
Namibia	120	120	109	130	99	NA
Kenya	129	133	123	133	82	NA
Africa	140	138	137	143	86	110.7
Zambia	147	151	144	146	71	61.5
Uganda	157	166	141	160	52	79.0

Table 9	ITU IDI 2016 RANK out of 175				ITU 2016	GSMA Q4 2016
	Overall	Access	Use	Skills	Active Sim per 100	MOU
Tanzania	167	158	172	162	74	151.5

In order to check whether the access and use components are linked to actual access and actual use for Africa, Table 9 was expanded to include active SIM cards data per 100 inhabitants and Minutes of Use (MOU) data.

In the overall rankings, Tanzania is at the bottom, but in terms of mobile tele-density, it is in 3rd place and in terms of Minutes of Use, it is in 1st place. It is striking that Tanzania is ranked by the ITU in 172nd place for use but it has the highest MOU of the selected countries, which all ranked higher.

In summary, the ITU's IDI is highly correlated with GDP per capita. A policy maker that is interested in measuring the "digital divide" and the "development potential of ICTs" would be well served by simply looking at GDP per capita.

Economist Intelligence Unit's Inclusive Internet Index (3i)

There are four categories to the index:

1. Availability: This category examines the quality and breadth of available infrastructure required for access and levels of Internet usage.
2. Affordability: This category examines the cost of access relative to income and the level of competition in the Internet marketplace.
3. Relevance: This category examines the existence and extent of local language content and relevant content.
4. Readiness: This category examines the capacity to access the Internet, including skills, cultural acceptance, and supporting policy.

The four categories are weighted 40%, 30%, 20% and 10% respectively. However, there is no cause and effect relationship between these factors - they are arbitrarily weighted. What is the link between availability and affordability? Between readiness and relevance? How did the EIU arrive at the weightings of 40%, 30%, 20% and 10%?



Figure 3: EIU's 3i conceptual framework (EIU, 2017).

Within these categories, indicators are also weighted. Within the usage category, the number of internet users, fixed broadband subscribers and mobile subscribers is weighted equally at 33.3%. In the African context, weighting fixed broadband penetration equal to mobile subscribers is problematic because penetration of fixed broadband is less than 1% across the continent. Penetration of mobile is exponentially higher.

Table 10: Overview of reviewed indices	
Objective	Catalyse action by informing the design, implementation and evaluation of policies across the public and private sectors

Table 10: Overview of reviewed indices	
Target Audience	Policy makers
Conceptual framework	Internet access is determined by Relevance (content); Readiness (enabling environment); Availability (Usage and infrastructure) and Affordability (price and competition)
Weighting	Availability = 40%, Affordability = 30%, Relevance = 20% and Readiness = 10%

Figure 4 plots an exponential trend line for the 3i score against GDP per capita, showing that the index is highly correlated with GDP per capita and it explains most of the variation in rankings.

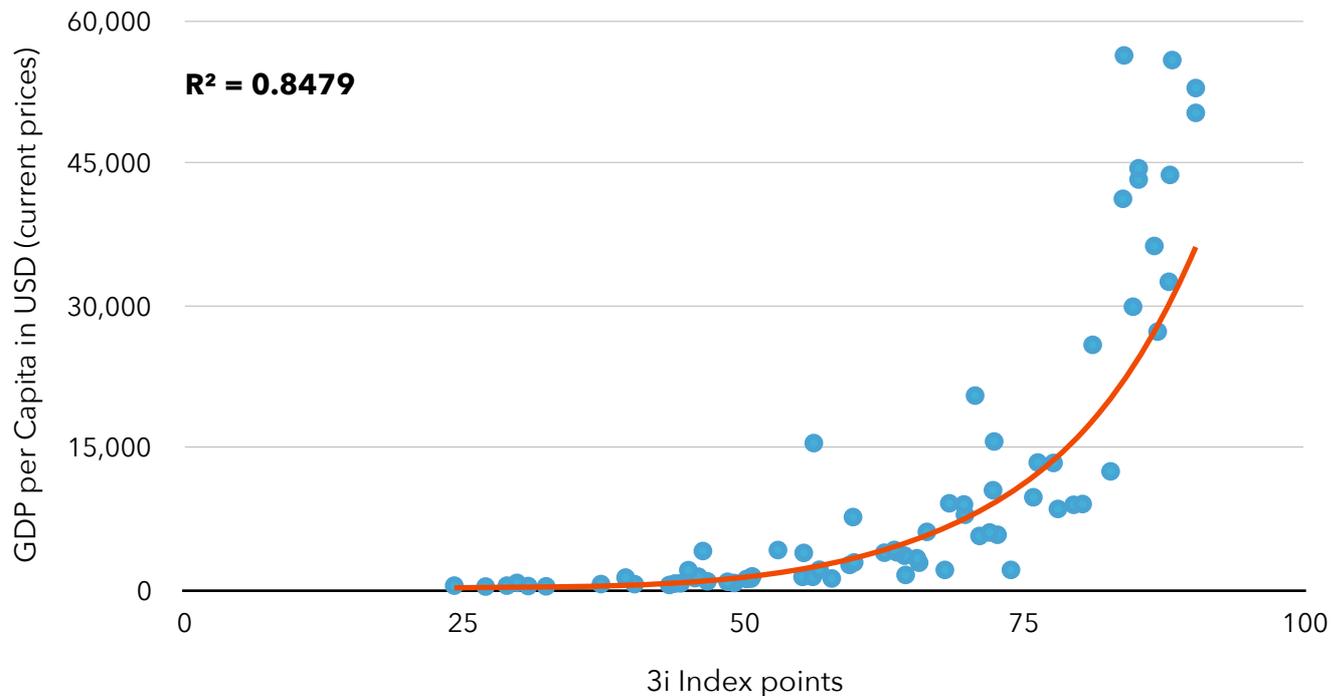


Figure 4: Variation in the EIU 3i (2017) explained by GDP per Capita current prices for 2016

Table 11 shows the R² for a number of basic price and access indicators. The highest R² score again is or GDP per Capita and second highest for 1GB as a percentage of GDP per capita.

Table 11: R2 EIU 3i link to other indicators	3i	Availability	Affordability	Readiness	Relevance
GDP per Capita: Linear	0.55	0.55	0.38	0.38	0.46
GDP per Capita: Exponential	0.85	0.86	0.66	0.62	0.60
Active SIM per 100 inhabitants	0.41	0.50	0.31	0.29	0.15
1GB Basket USD	0.03	0.01	0.03	0.06	0.05
1GB Basket % GDP per Capita: Linear	0.65	0.56	0.75	0.45	0.20
1GB Basket % GDP per Capita: Exponential	0.79	0.73	0.67	0.53	0.41
Landlines per 100 inhabitants	0.64	0.63	0.46	0.46	0.54
Mobile Internet users per 100 inhabitants	0.85	0.84	0.64	0.71	0.56

The EIU’s 3i claims that “[i]ts purpose is to outline the current state of internet inclusion around the world, and to help policymakers and influencers gain a clearer understanding of the factors that contribute to wider and sustainable inclusion” (Economist Intelligence Unit, 2017, p.8), so it is worth looking into its explanatory power.

Table 12	INCLUSIVE INTERNET INDEX Rank out of 75		Research ICT Africa Q4 2016 in USD1GB prepaid mobile broadband per month	
	Overall	Affordability	Cheapest in Country	Cheapest dominant MNO
South Africa	27	18	7.12	10.71
Ghana	49	49	2.46	4.92
Kenya	51	52	5.00	5.00

Table 12	INCLUSIVE INTERNET INDEX Rank out of 75		Research ICT Africa Q4 2016 in USD1GB prepaid mobile broadband per month	
	Overall	Affordability	Cheapest in Country	Cheapest dominant MNO
Tanzania	57	51	2.99	4.21
Africa	59	56	9.24	10.14
Uganda	64	68	3.44	10.03
Zambia	68	61	13.25	13.25
Comment	Namibia not available			

In Table 12, South Africa is ranked as the most affordable amongst the selected countries. Yet it is the second most expensive country for prepaid mobile data, which is the most important affordability indicator for policy makers and regulators in Africa. According to the EIU's 3i, South Africa is ranked at 18, compared to Tanzania at 51, Kenya at 52 and Ghana at 49. However, based on Research ICT Africa's 1GB prepaid basket data, South Africa is the second most expensive of the selected countries, so South Africa's high ranking is not justified. The explanation for the inaccurate listings is the incorrect pricing data: The price data used by the EIU is outdated and inaccurate and has overlooked promotions and top-ups, leading to false conclusions.

Alliance for Affordable Internet's Affordability Drivers Index (ADI)

A4AI'S ADI doesn't have an explicit conceptual framework like the other four indices covered in this paper. However, its description of the interaction of infrastructure and access implies that it has a similar approach to the WEF's NRI: policy and regulation (or environmental factors in WEF terminology) are the intermediary between infrastructure and access drivers¹⁴.

Table 13: Overview of reviewed indices	
Objective	Looks at the policy frameworks in place across 58 low- and middle-income countries to determine what changes countries have made lower prices and expand access – and what areas they should focus on to enable affordable connectivity for all.
Target Audience	Policy makers
Conceptual framework	No explicit framework
Weighting	No weighting

Table 13 compares A4AI's ADI to a selection of basic indicators ranging from price to access. The ADI scores are not as strongly related to GDP per capita as the other indices, yet still 50% of its variation is explained by it. Overall, the correlation between the ADI and any of the access and pricing indicators is relatively poor.

Table 14: R2 A4AI ADI link to other indicators	ADI	Infrastructure	Access
GDP per Capita: Linear	0.46	0.52	0.31
GDP per Capita: Exponential	0.54	0.57	0.39
Active SIM per 100 inhabitants	0.18	0.20	0.12
1GB Basket USD	0.03	0.01	0.07
1GB Basket % GDP per Capita: Linear	0.37	0.30	0.40
1GB Basket % GDP per Capita: Exponential	0.44	0.38	0.43
Landlines per 100 inhabitants	0.31	0.37	0.19
Mobile Internet users per 100 inhabitants	0.32	0.37	0.21

The ADI does not include prices in its index, but instead claims that it predicts pricing (A4AI, 2017, p.9), which it does not (see table 14). The ADI only explains 3% of variation in nominal mobile broadband prices. It explains more of the variation in affordability, measured as price expressed as percentage of GDP per

¹⁴ See Appendix 2: Methodology in A4AI, 2017.

capita, since it tracks GDP per capita. ICT policies or regulation can only influence the numerator (price) not the denominator (GDP per capita) of these affordability indicators.

Aside from the problems with the claim that A4AI's ADI predicts pricing, its index has multiple flaws:

- Several of the policy and regulatory indicators are biased, especially indicators such as the data on Universal Service Funds and the existence of a National Broadband Plan (unlike the EIU 3i, A4AI is concerned merely with the existence of a strategy, not whether it has any measurable targets), or is implemented at all - see South Africa, Kenya and Nigeria, all with failed acclaimed broadband plans.¹⁵
- Indicators are weighted equally, with no consideration given to how important some indicators are in relation to others.
- It uses rich country indicators for the Global South. For example, fixed broadband subscribers per 100 people is included as an indicator, despite the fact that less than 1% of Africans use fixed broadband.
- Indicators are duplicated: The index uses the percentage of individuals using the Internet and the number of unique mobile internet subscribers per 100 people. First, both indicators are very rough estimates whether one uses ITU or GSMA data (A4AI does not list sources in its report). Secondly, for Africa at least, the indicator is nearly identical.

Table 15	2017 Affordability Drivers Index (ADI) Out of 58				ITU 2016	GSMA 2017
	ADI Rank	Access Score	Infrastructure Score	ADI Score	Active SIM per 100	4G Coverage
Nigeria	13	67.66	43.70	56.58	83	51%
South Africa	22	61.00	39.78	51.2	155	67%
Ghana	26	60.68	37.75	50.01	128	30%
Kenya	30	61.55	34.53	48.82	82	18%
Namibia	31	61.29	33.66	48.24	99	40%
Uganda	32	58.57	35.77	47.93	52	45%
Tanzania	39	53.43	32.64	43.73	74	28%
Zambia	37	57.06	31.41	44.95	71	30%

Table 15 displays the ADI ranking and score for access and infrastructure. Nigeria scores better for both access and infrastructure compared to South Africa and Ghana, even though active SIM cards per 100 inhabitants is far higher for both South Africa and Ghana and 4G coverage is much higher for South Africa. Ghanaian or South African ICT policy makers, could not be blamed for dismissing the index based on this outcome.

GSMA Mobile Connectivity Index (MCI)

What sets the MCI apart from the other indices is that it only covers one sector, mobile telephony. This would make it immediately more useful to policy makers and regulators in developing countries, except that the GSMA uses a whole lot of indicators from other sources as an enabler for mobile and thus falls into the same trap other indices: an index score that is too aggregated to be meaningful.

The index measures four enablers of mobile internet connectivity, infrastructure, affordability, consumer readiness and content relevance for 134 countries. Australia scored the highest with an index score of 84.7 and Niger the lowest with 15.1 index points.

Table 16: GSMA 2016 RANK out of 134	Index	Enable Factors			
		Infrastructure	Affordability	Consumer	Content
South Africa	82	53	97	67	94
Ghana	96	101	110	96	85
Nigeria	98	97	76	116	88
Kenya	105	106	108	97	108
Tanzania	117	117	121	101	116

¹⁵ See RIA (2016) An evaluation of open access broadband networks in Africa: the cases of Nigeria and South Africa, <http://www.researchictafrica.net/home.php?h=206>.

Table 16: GSMA 2016 RANK out of 134	Index	Enable Factors			
		Infrastructure	Affordability	Consumer	Content
Uganda	118	111	129	109	124
Zambia	120	123	123	103	123
Namibia not available					

GSMA (2016b) reports a R^2 value of 0.78 between its index and mobile internet unique users based on 2014 data. Table 17 shows replicated results based on Q4 2016 mobile internet unique users and other ICT indicators.

Table 17: R2 GSMA MCI link to other indicators	MCI	Affordability
GDP per Capita: Linear	0.52	0.43
GDP per Capita: Exponential	0.88	0.80
Active SIM per 100 inhabitants	0.36	0.39
1GB Basket USD	0.00	0.01
1GB Basket % GDP per Capita: Linear	0.41	0.53
1GB Basket % GDP per Capita: Exponential	0.64	0.68
Landlines per 100 inhabitants	0.66	0.50
Mobile Internet users per 100 inhabitants	0.77	0.67

GSMA (2016b) does not mention, however, that GDP per capita captures variations in the index even better. The high score for unique mobile internet users raises the question how the GSMA estimates this indicator. Mobile operators only know how many active SIM cards use data but not the number of unique subscribers. This even applies for countries with mandatory SIM card registration where the person registering a SIM card may not be the one using it.

In July 2017, GSMA released a new edition of the MCI, modifying the original Index significantly. The new version of the MCI increases the number of countries from 134 to 150. The number of individual indicators has been extended from 38 to 39. Several indicators have either been removed or new indicators added: fixed-line and fixed broadband indicators have been removed, making the MCI a truly mobile index. However, the three main problems with the index have not been addressed:

- Some indicators (like the accessibility of top ranked Apple Store apps) are not useful proxies for developing countries. iPhone penetration in the developing world is generally very low, especially in comparison to Android, which has around 85% global market share.¹⁶
- Secondly, there are so many indicators that it's difficult to tell where the blockage might exist. Individual indicators are hidden behind layers of sub-indices.
- The Index only gives users the normalised indicator value not the actual one, limiting the usefulness of the index further. GSMA is typically very protective of its data, whereas one should expect it to act more in the public interest given the importance of mobile telephony for development and make the underlying individual indicators publicly available.

¹⁶ IDC, Smartphone OS Market Share, 2017 Q1, available at <http://www.idc.com/promo/smartphone-market-share/os>

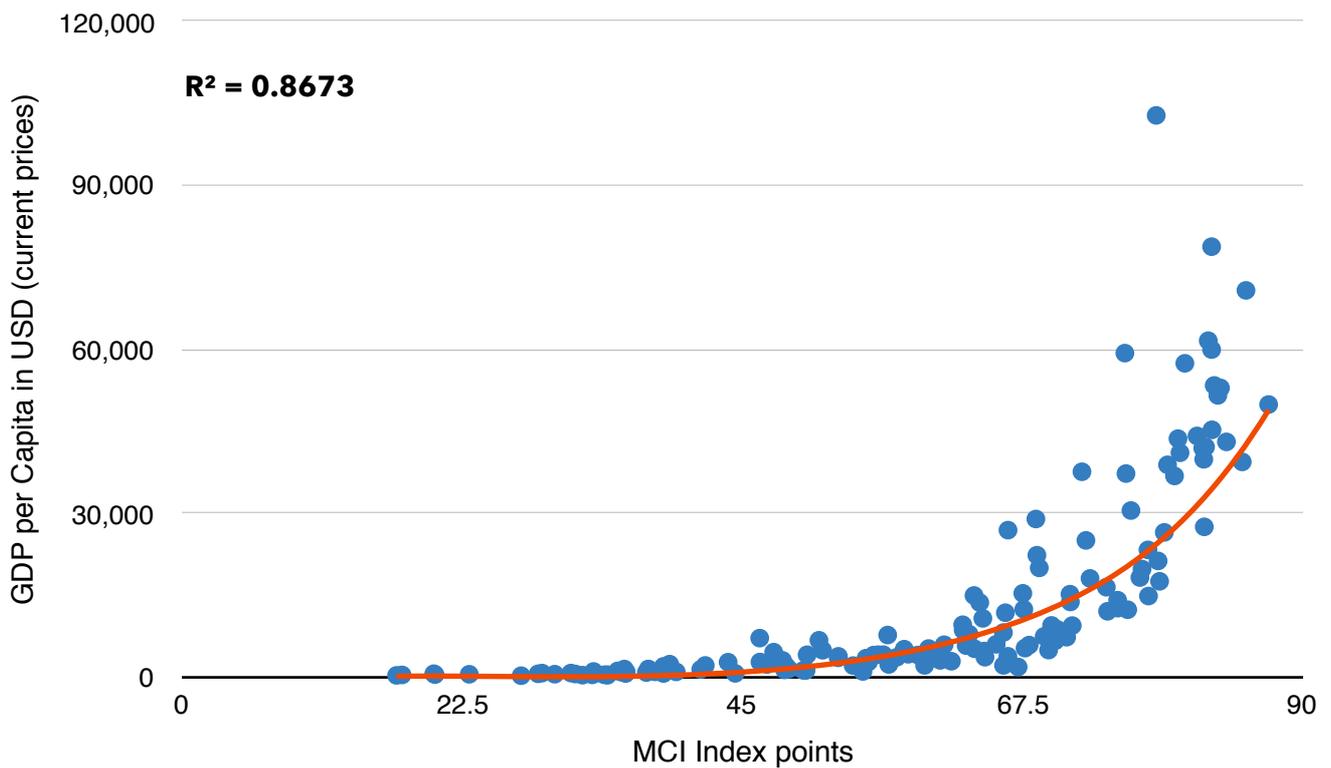


Figure 5: Variation in the MCI (2017) explained by GDP per Capita current prices for 2016

The new index too can be predicted by GDP per capita, which explains 87% in the variation of index values. The methodological approach inherent to global indices that uses indicators related to income is flawed. Rich countries will always have a higher adoption rate and more use than poor countries. The index thus does not tell the user anything new.

Summary

All of the reviewed indices have a strong tendency to include as many available indicators as possible. The lack of a carefully designed conceptual frameworks also contributes to the bias inherent in each of the reviewed indices. For example, the inclusion of fixed-line and fixed broadband indicators favours northern African countries and South Africa, Namibia and Mauritius in the African context. Globally it favours industrialised nations.

Aside from these conceptual flaws, the biggest challenge to each index is that GDP per capita explains most of variation in country scores. GDP per capita is not in the scope of ICT policy makers and regulators to influence.

Identifying which countries have done well based on global ICT indices is also difficult because a country's position changes dramatically depending on which index is considered. Table 18 shows the ranking of Indices, the price of 1GB of data, Active SIM cards and fixed line penetration per 100 inhabitants in order to illustrate how arbitrary the rankings are.

Table 18: Comparing rankings against selected ICT indicators								
	Ranking					ICT Indicators		
	ADI	3i	IDI	NRI	MCI	1 GB prepaid data in USD	Active SIM cards per 100	Fixed-line per 100
Nigeria	13	45	137	119	98	3.20	83	0.10
Kenya	30	51	129	86	105	5.00	82	0.19
Ghana	26	49	112	102	96	2.46	128	1.01
Namibia	31	NA	120	99	NA	5.89	99	7.42

Table 18: Comparing rankings against selected ICT indicators

	Ranking					ICT Indicators		
	ADI	3i	IDI	NRI	MCI	1 GB prepaid data in USD	Active SIM cards per 100	Fixed-line per 100
Brazil	10	18	63	72	56	8.48	124	21.01
Sources	A4AI 2017	EIU 2017	ITU 2016	WEF 2016	GSMA 2016	RIS / RIA Q4 2016	ITU 2016	ITU 2016

A country's affordability ranking should only improve if prices have dropped more for a country compared to other countries. While this sounds straightforward, it is actually something that existing indices get wrong. Affordability indicators may change not because of prices changes but because of changes in GDP per capita, something ICT policy makers and regulators have little control over. The effect of well designed regulatory interventions may be masked by other economic events and their impact on GDP per capita. This means that policy makers are better served by looking at simple, individual indicators rather than composite indices.

The other problem is that very few indices have up to date composite pricing data, especially for developing countries. Prices used by the ITU, for example, can be two years old when they form part of their index - light years in pre-paid mobile markets.

Benchmarking of ICT Indicators

This section demonstrates how interpreting individual indicators within an ecosystem framework with causally linked components provide actionable advice to policy makers and regulators.

We are using a benchmarking methodology to analyse the mobile sector ecosystem of African countries. Benchmarking is a process of identifying ways to improve performance and integral to this process is identifying the cause of a country's performance. It is not important where a country features in a global ranking but what other countries with similar problems have done better or where they have failed. Both success and failure are of equal importance for the analytical process.

Various implications may follow based on the results of the analysis. For example, if mobile prices are too high the cause is often insufficient competition. Competitive bottlenecks include high market concentration, monopoly control over essential facilities and high, above cost, wholesale pricing, such as mobile termination rates (MTRs). Retail prices could be reduced by safeguarding fair competition through lowering MTRs to the cost of an efficient operator. The consequence of remedying this would be greater mobile penetration and usage because more people can afford to use mobile phones. What is the mobile ecosystem?

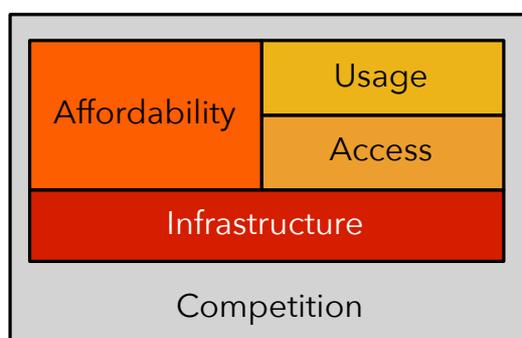


Figure 5: ICT ecosystem

The mobile ecosystem is conceptualised as an interconnected, multilayered ecosystem of communications networks, services, applications, and users. An ecosystem approach enables the identification of linkages between different elements in the system, and reveals how the effective functioning of one part of the system is dependent on the successful functioning of other parts. The environment created by each element of the ecosystem and the relationships between these elements, determines how conducive the overall environment is to investment that is needed to drive the growth of the sector.¹⁷ It explains whether people have access to, and can afford, mobile technology and supports the process of determining what interventions are likely to succeed, given the composition of the ecosystem. The Diagnostic tool assesses the mobile ecosystem through five components or building blocks. Each building block consists of several indicators:

- **Affordability:** Price is a key indicator of the level of competition in the sector. The price of mobile voice and data services are the starting point for any assessment of the sector's performance. If mobile voice and data prices are high in comparison to the benchmarked countries, then the causes of high prices need to be assessed. In most countries, the mobile voice market is maturing and prices have been in steady decline. In comparison, mobile data is a rapidly growing market and prices are far more volatile. In countries where both voice and data prices are high, there are usually significant obstacles to increased access and usage.

¹⁷ This approach and these five components have evolved from the ICT sector performance reviews undertaken by RIA across multiple African countries for over a decade.

- **Access:** The category of access is defined by a set of indicators capturing the prevalence of mobile connection devices as well as internet use. Access is linked to affordability because lower prices mean greater access.
- **Usage:** Usage measures the consumption of mobile services such as voice and internet. Content is a difficult indicator to assess due to the global nature of the internet: content is consumed from around the world. However, local content remains a critical indicator of usage. The analysis measures local content by the number Facebook users since Facebook is locally produced content.
- **Infrastructure:** Infrastructure requires investment and fair competition provides an incentive for mobile operators to invest in infrastructure. The analysis measures both the extent and quality of infrastructure available in a country. The extent of infrastructure is measured by network coverage - how much of the population has access to mobile signal. The quality of infrastructure is measured by the number of subscribers per Base Station (BTS). The level of investment is further expressed as investment per subscriber.
- **Competition:** The competition component impacts upon - and is impacted by - the other components since it is at the heart of any ecosystem outcome. Fair competition in the sector leads to reasonable returns on investment for operators and affordable prices for end users. Competition is evaluated by a concentration measure (the Herfindahl Hirschman Index) and wholesale prices such as mobile termination rates.

The starting point for the analysis is price: in comparison to other countries, is mobile (voice and data) affordable? To do this analysis, the diagnostic tool uses the only, quarterly updated, comprehensive mobile pricing database of global south countries in the world. The data in the mobile pricing database is collected by Research ICT Africa and Research ICT Solutions every quarter and covers 91 countries in Africa, Latin America and South East Asia. If prices are competitive (i.e., are prices lower than other, comparable countries), then other components, such as access, competition, usage and infrastructure should all be competitive as well. If prices are not competitive, then each component of the ecosystem needs to be analysed in order to discover the obstacles to improved access and usage.

The ICT Diagnostic Tool puts all this analytical power on one simple instrument. It gives the user the ability and responsibility to select countries to benchmark. ICT indicators are not aggregated and there is no index. Instead the user can analyse each indicator by itself. The analytical process requires an understanding of the ICT sector, which can be assumed for policy makers and regulators. It is not suitable for someone that is not engaged in either.

Case Studies

The use of case studies allows the analyst the ability to isolate the impact of theoretical concepts in a detailed and potentially more compelling manner. Case studies enable the analysis of both the determinants and consequences of the theoretical concepts. The analytical power of indices for Uganda and Zambia are compared to the analytical power of a benchmarking approach. We first benchmark two of the leading countries in terms of market dynamism in Africa. Ghana and Kenya were selected because they have some of the lowest prices in Africa and share similar socio-economic conditions. South Africa is the most developed postpaid market, in Africa, Tanzania has the most mobile operators, Uganda is a land-locked country like Zambia with a competitive ICT sector and Namibia is a small country with prepaid innovations and therefore a leading market.

The application of the diagnostic tool through the application of empirical data to the case immediately highlights the position of a country against the key indicators of policy outcomes.

Zambia

On every indicator that is part of the affordability component, Zambia is expensive. Comparing cheapest prices available in a country for voice and data baskets shows that Zambia's are twice the benchmark average. Comparing dominant operators Zambia is still a lot more expensive than the chosen peers. The low Value for Money Index (VMI) shows that top up bundles do not provide much value for Over The Top (OTT) users.

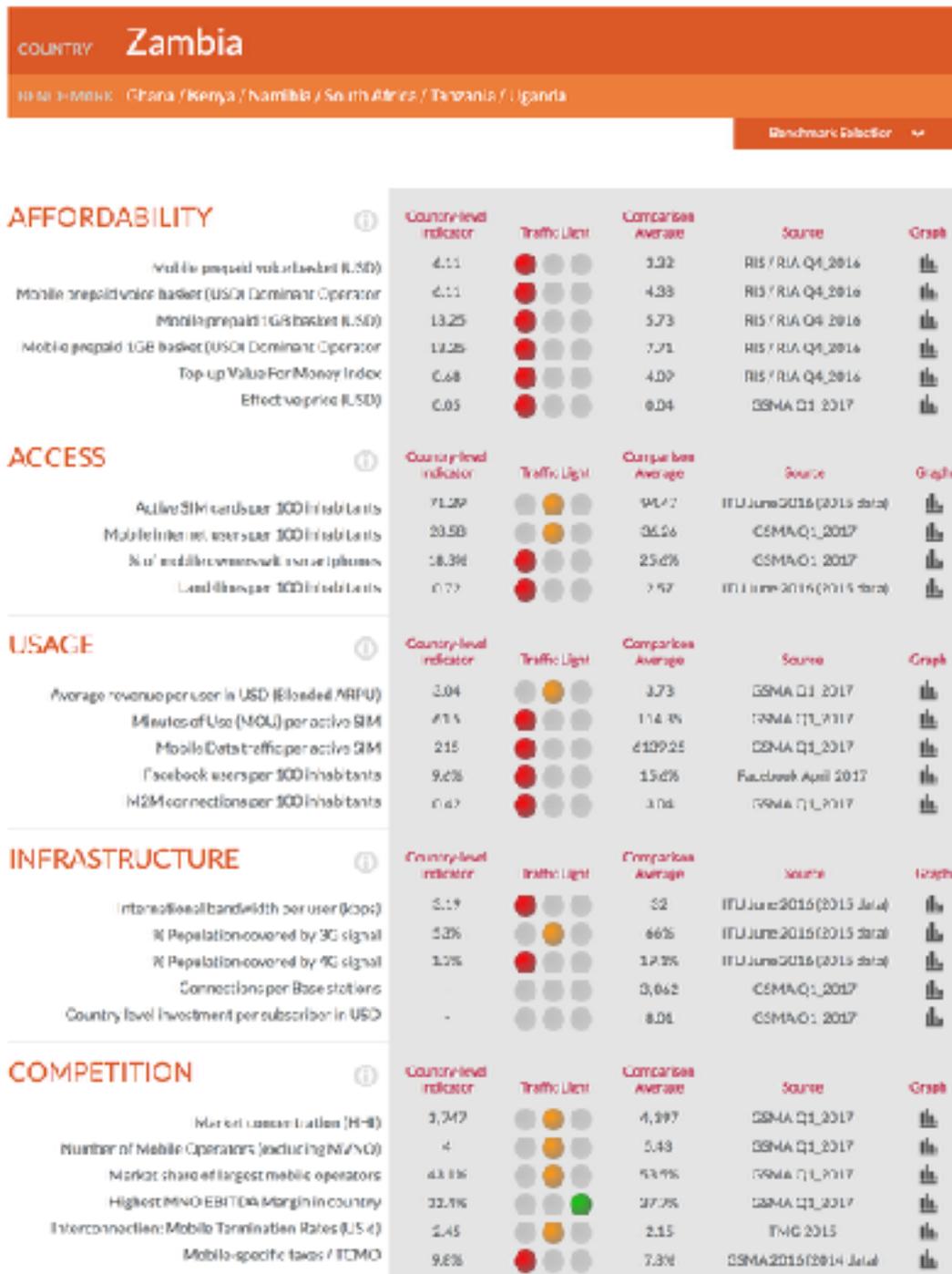


Figure 6: Benchmarking Zambia against Ghana, Kenya, Namibia, South Africa, Tanzania and Uganda

Access is low or average. Usage in terms of minutes of use and data per month is low which can be expected based on the high prices. International bandwidth per user is very poor, with the comparison average being more than 10 times higher. Part of the explanation is that Zambia is a landlocked country and therefore exposed to the risk of high cross connection charges to access undersea cables. Notably is

also the very low 4G coverage. Zambia is in urgent need of substantial investment to upgrade its mobile telecommunication infrastructure.

Competition indicators in Zambia are similar to the comparison countries. Three mobile operators are usually sufficient for a competitive environment and market concentration is below the benchmark average. Although the market share of the largest operator is high at 43%, this is nevertheless lower than the comparison average. Mobile termination rates are adequate and the EBITDA margin of the most profitable mobile operator is reasonable at 37.7%.

The first analysis shows that prices are high and usage is low as a consequence. Mobile operators are not excessively profitable and the first intervention point would be seeking ways to make the mobile ecosystem more conducive. Reducing mobile specific taxes, which are high in comparison is a first starting point. The steps to be taken are:

- Engage mobile operators on their high prices and low investment. What are price elasticities or who would usage change if prices came down? Why have they not yet rolled out 4G on a large scale?
- Engage policy makers on lowering mobile specific taxes. Which higher EBITDA margins MNOS are also more likely to invest.
- Engage to regulators whether there may be other investment obstacles from regulatory side: spectrum , licensing, regulatory fees etc.

Uganda

Uganda is benchmarked against the same set of countries as Zambia bar Zambia. Uganda is very cheap for voice and SMS when considering the cheapest prices in the country but expensive cheapest prices of dominant operators are concerned.

Uganda is average, but on the lower end of average for data as well except when limiting the comparison to dominant operators, where it is then expensive in comparison. A question arises who such a large difference between cheapest in country and cheapest from dominant operators can persist over time without causing a massive loss of subscribers of the dominant operators. Uganda compares poorly for access, usage and infrastructure to its peers but in terms of competition indicators it is either average or leading, except for mobile specific taxes.

Dominant operators, the biggest having a marketshare of 55% do not seem to be fussed by low prices of smaller operators. The question is why? Following up with regulators and MNOs revealed that the smaller operators only offered services in the Kampala / Entebbe area and that only dominant operators, in particular the biggest operator have extensive national networks. Policy makers and regulators thus need to find ways on how to increase competition on national level.

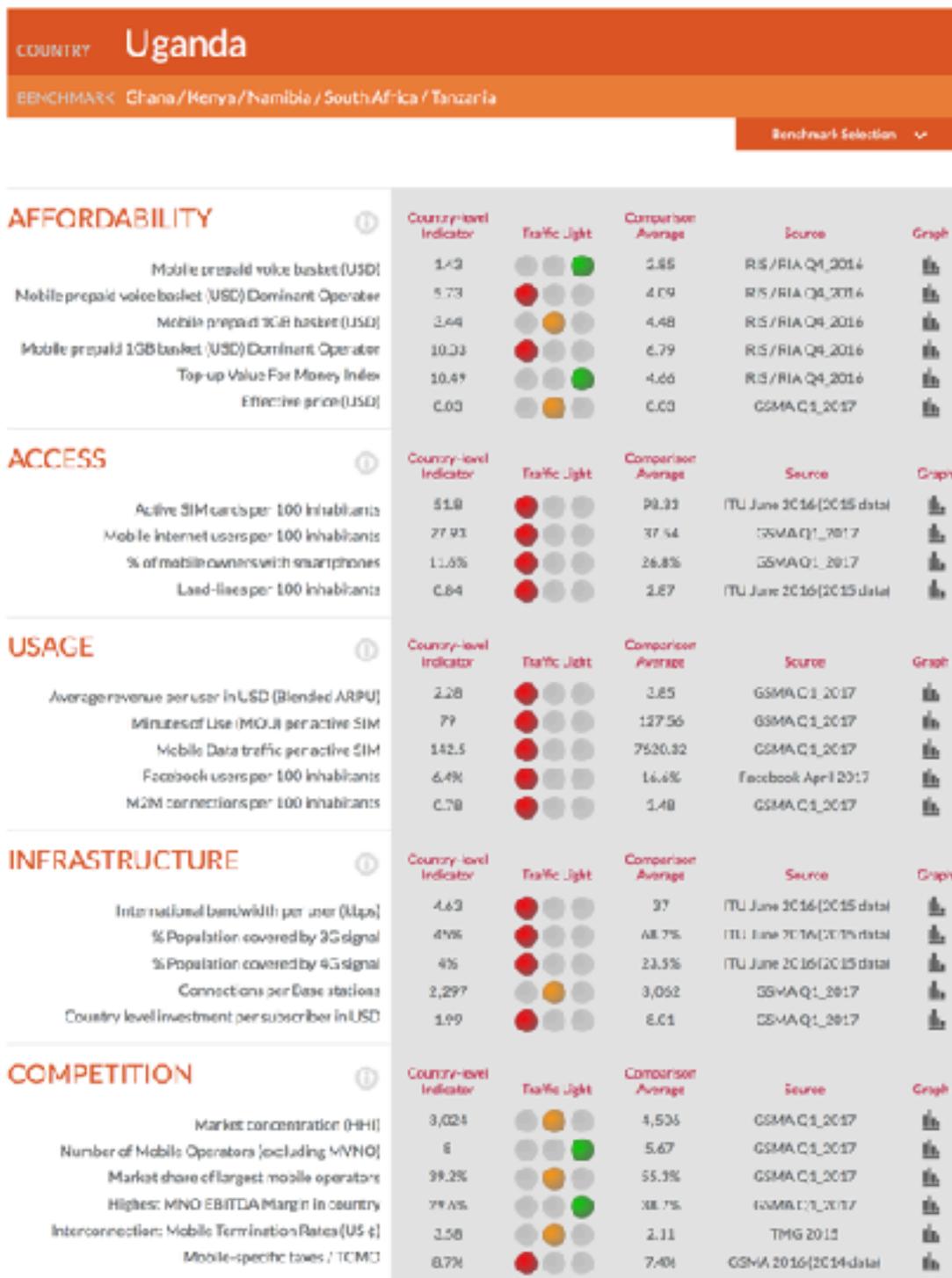


Figure 7: Benchmarking Uganda against Ghana, Kenya, Namibia, South Africa and Tanzania

Conclusion

The problem with global indices is not the underlying individual indicators. Many of the indices, such as the GSMA, make use of interesting and innovative data sets. The problem is the compulsion to add all these indicators together, disguising the underlying indicators in a web of statistical analysis in order to produce a ranking that in trying to capture the complexity of the evolving ICT ecosystem in fact misleading or is unable to produce useful recommendations to policy makers and regulators.

The alternative benchmarking approach, encapsulated in the mAccess tool with the up to date and extensive datasets that underpin it is able to provide an instant picture or baseline for the country relative to similar countries. While it does not give all the answers one needs for comprehensive sector review, it provides a baseline for deeper analysis. Possible remedies or interventions are then assessed in the context of the political economy of the country, the institutional endowments, the market structure of ICT sector, the capacity and adaptiveness of the various sector agencies and the levels of human development within the country that may determine the technological absorptive capacity of the country.

	Zambia's Ranking	Uganda's Ranking	Out of
WEF NRI	116	121	152
ITU IDI	147	157	175
EUI 3i	68	64	75
A4AI ADI	37	32	58
GSMA MCI	120	118	134

This paper demonstrated that select indicators, rooted in an ecosystem framework that provides a clear chain of cause and effect, is a helpful guide to ICT policy makers and regulators, especially in comparison to aggregated composite indices.

There are four key conclusions:

- The five indices reviewed here mostly track GDP per capita, something ICT policy makers and regulators can do little about. The same applies for any of the affordability indicators that divide price by GDP per capita. Price is a much more effective indicator to measure policy or regulatory interventions, since it is directly impacted by policy and regulatory decisions.
- None of the indices reviewed significantly explains price differences between countries.
- Carefully selected individual ICT indicators will always outperform any of the global ICT indices in terms of explanatory power of the ICT sector and any policy or regulatory interventions.
- The benchmark approach based on a minimal number of indicators to explain causal links within the sector is a better approach in order to understand obstacles to growth and what steps can be taken to improve sector performance.

Existing indices can be improved in several ways.

1. Global indices need to accommodate the shift towards data. To assess this in developing countries this means relying less on landline indicators and more on mobile broadband indicators.
2. Similarly, wired and mobile components should be split because the skills and resources that are required are fundamentally different for mobile and fixed broadband and so is the regulatory and policy treatment.
3. Indices should allow users to pick countries to benchmark against in addition to displaying rankings.
4. Indicators that make up indices should be made available in non-normalised form to allow users to understand indices and sub-indices as well as to verify the index outcomes with country data.
5. As demand side factors influence outcomes more in an Internet environment, accurate indicators to assess human development are required. Outside of demand side survey, generalised education indicators such as school throughput, or education attainment are not likely to be adequate.

Indices are compelling because they allow global organisations, like the ITU, to produce output for all member states. They are attractive to donors and aid agencies because they provide seemingly simple answers to complex problems. For large industry associations, global platforms they provide backdrops for lobbying, that intersect with powerful epistemic communities used to enforce conventional wisdom and

'best practices'. These are generally based on mature competitive markets, largely effective, resourced institutions to regulate them and democratic political systems underpinned by the rule of law. With these assumptions erroneous in many parts of the global south and several success stories derived from alternative regulatory strategies that acknowledge and innovate around these constraints, these generalised, at best, misinformed at worst, composite ICT indices do not provide a substantive evidence base to assist ICT policy makers and regulators in decision-making.

This paper demonstrated that analysing ICT indicators, through diagnostic benchmarking, is far more effective for policy and regulatory purposes than aggregating them into indices.

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