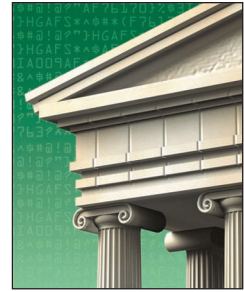Editor: Stephen Ruth • *ruth@gmu.edu*

By the Numbers — A Researcher's Bonanza of ICT Policy-Level Information

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Many valuable sources for detailed analyses of international information and communications technology policy data are available at low or no cost from various organizations, but most have a policy agenda, too.

For the reader who uses technology numbers all day, the topic of information and communication technology (ICT) rankings and performance indices might seem a bit over the top. Yet, many might not be aware of the amazing variety of detailed, high-quality ICT measurements and analyses — especially telecom-related statistics, charts, and graphs — available. These measurements come in many forms: ICT aggregates for cities, states, nations, and regions; user-behavior trend analysis; Internet-penetration comparisons; download and upload speeds; quality of service; government telecom tariffs; and so on. Many are in the public domain and available at no cost, although others are proprietary, such as TeleGeography (www.telegeography.com), and offer fee-based services. Here, I'll cover some of those that are available at no cost.

The International Telecommunications Union

For international telecom statistical summaries, the mother lode is the International Telecommunications Union (ITU), part of the UN and headquartered in Geneva (www.itu.int/ITU-D/ict). ITU's annual brief summary of global telecom policy issues always offers some insights. In fact, the 2010 version of *The World in 2010 — ICT Facts and Figures* includes several fascinating statistics.[1] For example,

- roughly 82 percent of the 5.5 billion cell phone subscribers worldwide still use 2G connections;

- short-message service (SMS) calls — the data application with the highest use globally — tripled from 2007 to 2010 to an annual total of 6.1 trillion, generating revenues of US$812,000 per minute; and

- the developing world's fixed (wired) broadband connections rose to 45 percent of the global total by the end of 2010.

But the ITU site offers far more than zingers. It has a 2009 database consisting of more than 100 telecom/ICT indicators — such as population, gross domestic product per capita, fixed telephone lines, mobile cellular subscriptions, fixed Internet subscriptions, fixed broadband subscriptions, ratio of mobile cellular subscriptions to fixed telephone lines, and so on — for 230 countries (www.itu.int/ITU-D/ict/index.html).

Another popular ITU report is *Measuring the Information Society 2010*.[2] It provides annual updates on two aggregate measures that are useful in public policy analysis. The first is the ICT Development Index (IDI), a composite of 11 variables — such as fixed telephone lines per 100 inhabitants, international Internet bandwidth per Internet user, proportion of households with a computer and with Internet access, adult literacy rate, Internet users per 100 inhabitants, and more — for 159 countries. The IDI measures four levels: evolution over time, progress in ICT development, the digital divide, and development potential. Although the raw scores and rankings are interesting and usually show North America, Western Europe, Hong Kong, Japan,

and South Korea in the top positions, the greatest value of IDI is assessing emerging ICT changes in developing nations, where we find nearly half the fixed broadband connections and a major share of cell phone users. The charts in *Measuring the Information Society 2010* (pages 16 and 17) compare several companies on the basis of the index's various elements.[2]

The second significant indicator is the ICT Price Basket, a unique composite index that considers the actual cost to the telecom service's consumer.[2] It also considers tariffs for each country on fixed telephone, mobile device, and broadband services. Because the IDI doesn't have a comparative cost component, the ICT Price Basket is a useful complement that indicates trends and progress, which can point to policy options that consider consumers' out-of-pocket costs. You'll probably find the most up-to-date and comprehensive ITU data on its free statistics page (www. itu.int/ITU-D/ict/statistics/index. html), where numerous summaries, charts, graphs, and comparisons are available on topics such as global ICT trends, fixed and mobile telephony, benchmarking, development trends, and so on. The ITU updates this page at regular intervals, making it particularly valuable for researchers.

Global Competitiveness

The World Economic Forum produces an annual report that ranks nations worldwide on a global competitiveness scale. The *Global Competitiveness Report 2010–2011* always shows the developed nations ahead of the developing nations on most dimensions and includes among its 12 pillars (measured variables) several interesting ICT-related measurements, such as technological readiness, infrastructure, higher education, and training.[3] As with the ICT Price Basket I mentioned earlier, the key insights aren't so much the rankings but the detailed comparisons

of regional trends in technology. For example, many Latin American and Caribbean (LAC) nations are showing increased capacity for competitiveness from the previous report, due in part to boosts in Internet penetration rates, especially wireless services, where LAC is becoming a growth leader globally.

Digital Economy Rankings

Every year, IBM and the Economist Intelligence Unit collect data to rank roughly 60 of the world's economies in the context of ICT-related issues. *Digital Economy Rankings 2010 — beyond E-Readiness*, similar to many other reports, arrays national economies according to roughly 100 variables, many of them unique composites.[4] To give a sense of the index's complex elements, here's a sample of new indicators added for the 2010 rankings:

- a broadband-quality indicator to measure, as a proxy for quality, the share of fiber-optic access lines in a country's total broadband access lines;
- a mobile-quality indicator to assess the share of 3G and 4G mobile subscriptions in a country's total mobile subscriptions;
- a lowest DSL connection speed to measure broadband affordability, now at 256 kilobytes per second (kbps) and previously at 128 kbps;
- a scoring scale for Internet user penetration, now with 100 percent of the population representing the highest penetration achievable in a country (previously 75 percent); and
- an expanded education-level indicator to encompass a third subindicator — gross enrollment in tertiary education — which measures the number of students in higher education as a share of the total population in the relevant five-year age group.

Clearly, the availability of data like this is of interest for technology policy

decisions, for example, estimating the effect of 3G and 4G service on various sectors, like business and education. But it is equally useful for businesses planning build-out of wireless and fibre infrastructure.

The New Economy Index

The 2010 State New Economy Index: Benchmarking Economic Transformations in the States (www.kauffman. org/uploadedfiles/snei_2010_report. pdf) — prepared annually by the Washington, DC-based International Technology and Innovation Foundation (ITIF), with support from the Kaufman Foundation — uses a series of five indicators (knowledge jobs, globalization, economic dynamism, the digital economy, and innovation capacity) to rank economic potential at the state level. In 2010, the top five were Massachusetts, Washington, Maryland, New Jersey, and Connecticut, whereas the lowest were Wyoming, Alabama, Arkansas, West Virginia, and Mississippi. The digital economy indicator's ICT-related components are the percentage of the population online, how state and local governments use information technologies to deliver services, IT's role in the healthcare sector, how farmers use the Internet and computers, and residential and business access to broadband telecommunications.

Think Tanks

Many nonprofit think tanks deliver up-to-date summaries on ICT topics as varied as Internet economics, network neutrality, copyright, technology diffusion, innovation policy, and so on. The New America Foundation and the ITIF are excellent examples. Both produce position papers on pending telecom legislation, detailed summaries of emerging technology, and streamed webinars where significant international thought leaders discuss policy topics. For example, in 2010, the New America Foundation hosted a widely viewed webinar, "Does the Internet Favor Dictators or

Penetration metrics	Rank among OECD 30 countries	Speed metrics	Rank among OECD 30 countries	Price metrics	Rank among OECD 30 countries
Penetration per 100, OECD	15	Maximum advertised speed, OECD	9	Price for low speeds, combined	9
Household penetration, OECD	15	Average advertised speed, OECD	19	Price for median speeds, combined	19
3G penetration, telegeography	19	Average speed, Akamai	11	Price for high speeds, combined	18
Wi-Fi hotspots per 100,000, Jiwire	9	Median download, http://speedtest.net	11	Price for very high speeds, combined	19
		Median upload, http://speedtest.net	5		
		Median latency, http://speedtest.net	17		
		90% download, http://speedtest.net	11		
		90% upload, http://speedtest.net	7		

■ 1st quintile
■ 2nd quintile
■ 3rd quintile
■ 4th quintile
■ 5th quintile

Figure 1. US ranking in the Organization for Economic Cooperation and Development nations based on various indicators. (Source: http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/Berkman_Center_Broadband_Final_Report_15Feb2010.pdf.)

Dissenters?" (www.newamerica.net/events/2010/retreat_live_webcast), featuring presenters Eric Schmidt, Google's CEO; Tim Wu, Columbia law professor and author of *The Master Switch*; James Fallows of *The Atlantic Monthly*; and Alex Ross, the US Department of State senior advisor for innovation. The ITIF holds many webinars and also produces dozens of policy analysis documents such as Robert Atkinson's "Network Policy and Economic Doctrines."[6]

Other Rankings and Indices

Anyone examining the proliferation of wireless services in LAC would find the Inter-American Development Bank's report "Economic Development and Inclusion through Local Broadband Access Networks" highly valuable.[8] In addition to the LAC nations' telecom progress rankings and analysis, the report gives nearly two dozen case studies of wireless implementation. The Organization for Economic Cooperation and Development (OECD) offers statistics for the 34 OECD nations, but no case studies (www.oecd.org/document/23/0,3746,en_2649_34225_33987543_1_1_1_1,00.html).

Many other specialized reports assess unique ICT and telecom aspects. For example, the University of Washington's Technology and Social Change Group has developed a report called *Measuring Global Public Access to ICT: Landscape Study Summary Reports from 25 Countries Around the World*.[9] The report covers a sample of 25 developing nations and evaluates how they use ICT in libraries, telecenters, cybercafés, and other public settings. Like many of the other reports described here, it gives a score sheet for each country based on demographics, such as income, education, age, and gender.

Harvard's Berkman Center's major ICT report, *Next Generation Connectivity: A Review of Broadband Internet Transitions and Policy from around the World*, has telecom rankings of all types but primarily emphasizes Internet penetration, speed, and cost in the OECD countries.[10] It also includes several analyses and tables not easily found elsewhere — for example, trends in public wireless hotspots, comparisons of advertised versus actual download and upload speeds, 20 top OECD cities in download speed, and comparisons between OECD and TeleGeography pricing of various Internet services (high, medium, and low speed). Interestingly, many of the studies point to the significant lowering effect on cost caused by the presence of two or more competitive providers in a region. Because

the Beckman report emphasizes the OECD nations, China, India, Brazil, Indonesia, and several other large non-OECD countries aren't included. Figure 1 shows a composite ranking from *Next Generation Connectivity.*

One of the best one-stop sources of almost everything imaginable in telecom and related ICT demographic statistics is at the World Stats site (www.internetworldstats.com). As stated on its summary page, "Internet World Stats is an International website that features up-to-date world Internet usage, population statistics, and Internet market research data, for over 233 individual countries and world regions ... a useful source for e-commerce stats, online international market research, the latest Internet statistics, broadband and penetration data, world population statistics, and telecommunications markets information and reports." It has links to many other ICT intelligence sites such as the ITU, the Cooperative Association for Internet Data Analysis, the Internet Corporation for Assigned Names and Numbers (ICANN), the National Science Resources Center, Renesys, RefDesk, ClickZ, and so on. World Stats also has abundant charts, graphs, and summaries.

For telecom applications in the US, the National Broadband Plan (NBP), the US Federal Communications Commission's (FCC's) future-oriented

telecom deployment blueprint, is also a rich source of graphs, charts, and analyses about wireless availability zones, auctions, spectrum availability, and so on.[11,12] The report includes many detailed US and international telecom statistics summaries. For example, "Exhibit 10–A" on page 203 of *Connecting America: The National Broadband Plan* shows an international comparison of electronic health adoption, showing the US well behind many other developed nations.[11] For electronic government rankings and analysis, many of the same types of detailed summaries and country-by-country analyses exist. The UN's Department of Economic and Social Affairs produces the most comprehensive report, *E-Government Survey 2010: Leveraging E-Government at a Time of Financial and Economic Crisis.*[7]

Pew Internet & American Life Project

In addition to a vast array of ICT network performance and penetration statistics, an impressive amount of survey data is available about how users actually feel about various ICT interventions. The Pew Internet & American Life Project's aim is to produce "reports exploring the impact of the Internet on families, communities, work and home, daily life, education, healthcare, and civic and political life" (http://www.pewinternet.org/About-Us. aspx). The surveys cover issues such as podcasting, social networking, online banking, the digital divide, and dozens of others. According to an article in *The New York Times*, a recent Pew survey of US Internet users found that 75 percent of those earning more than US$75,000 annually use the Internet extensively at home, whereas only 57 percent of those in the $30,000 or less category do.[13]

You're probably surprised at the completeness, variety, and analytical rigor of these free online resources and might wonder about how or whether they're used. I should mention that most of them originate from organizations that have a stake in their use. The FCC is trying to convince the US Congress, ISPs, content providers, and the American people of its view of broadband deployment strategy. The UN, ITU, OECD, IDB, World Bank, and other organizations all represent non-neutral policy perspectives — that is, each has an agenda. So, whoever uses this data should read very carefully the extensive, detailed descriptions that accompany them to learn how each organization derives each number and index. In all the cases I've mentioned in this article, each organization meticulously explains how it derives its indices, rankings, and so on. In my experience using these sources in my own research and working with those who develop them, they're highly valuable and serve a crucial purpose in sorting out many competing views about ICT deployment. 🖂

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