Connectivity Scorecard 2011

United States of America

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7.82

	Score	Weight
Consumer Infrastructure	0.72 (0.95)*	0.17
Consumer Usage and Skills	0.77 (0.79)*	0.17
Business Infrastructure	0.86 (0.86)*	0.41
Business Usage and Skills	0.68 (0.83)*	0.18
Public sector Infrastructure	0.75 (0.79)*	0.06
Public sector Usage and Skills	0.76 (0.79)*	0.02

*The score of the leading performer for this component

Table 1: Component Scores & Weights 2011

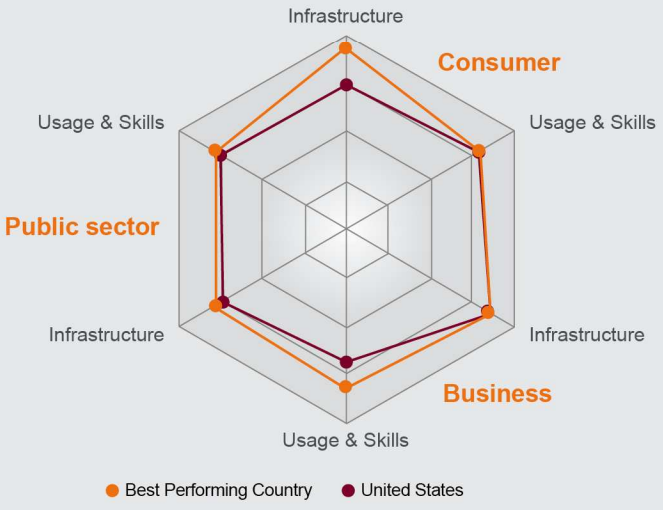

Fig 1: Component Scores 2011

Overall performance

This year, the United States scores 7.82 and finishes in a virtual dead heat with Sweden which scores 7.48 at the top of the Innovation-driven[1] economies on the Connectivity Scorecard 2011. This gap has closed since last year, and while some of this reflects changes to the indicators used this year, in some cases (e.g., consumer infrastructure) there is an element of U.S. "catch up" on measures such as typical broadband speeds.

As was the case last year, the U.S.' top score on the "business infrastructure" component of the Scorecard (which also happens to be the single most heavily weighted component), propelled its performance.

Strengths and Weaknesses

Overall, the U.S. performance continues to rely on a very strong ICT-oriented business sector, but the U.S.' overall performance on deployment of advanced consumer-facing infrastructures continues to trail the Far East, although not necessarily Europe. The U.S. is actually ahead of many larger Western European nations in the extent of deployment of very high speed broadband networks, but a fair take on matters is that most large Western nations trail Japan and Korea by large margins on deployment of such networks. However, the economic meaningfulness of this "gap" might be questionable, since there are few current applications that utilise the very high speeds, and even though the number of consumers receiving very high speeds has grown in the United States, one has yet to see a critical mass of transformative applications that utilise the higher speeds. Instead, much innovative activity appears to be concentrated on the development of wireless broadband, an area in which the U.S. is rapidly closing the gap with the leading countries, although still behind—for instance, 3G subscriptions correspond to just over a half of all U.S. subscriptions currently; yet the same ratio is 90% or higher in Japan and Korea.

[1] As defined by The World Economic Forum www.weforum.org

On the "public sector" metrics, the U.S. is a strong performer, ranking highly both on assessments of E-Government services availability, and also on spending by the "public" or at least partially public sector in healthcare and education However, the type of data that are available on ICT adoption and outcomes in the health and education sectors is patchy, and insufficiently comprehensive for inclusion in a Scorecard that aims to cover 25 countries. It should be noted that on some studies of ICT adoption in the healthcare sector, the United States does not perform well.

Detailed discussion

Consumer infrastructure

On this measure, the United States scores 0.72. This score is well up from 0.57 last year. However, the rise in the United States' score has to be seen in the context of a rise in overall scores, with the average score in 2011 being 0.67 compared to an average score of 0.53 in 2010. The change in most countries' consumer infrastructure performance owes to the inclusion of three indicators which tend to equalize countries' performance. These three indicators are (a) fixed broadband coverage, (b) 3G coverage, and (c) unique user mobile penetration. On the first two indicators, most "innovation driven" nations have at least 80% to 85% of their population covered by wireless and fixed-line broadband networks. On the third metric, most nations have around 60 percent of their population that owns a mobile device, but the proportion seldom if ever exceeds 95 percent. Thus this indicator shows only limited variation. Had we used the more conventional, but less merited, indicator of "SIM cards per 100 population" (which is how many agencies measure mobile penetration) there would be some more variation on the "mobile penetration" metric as some countries have SIM card penetration rates of 150 per 100 population or more. The U.S., as with most other countries, benefits from the inclusion of these "levelling" metrics.

Interestingly, the U.S. does better than most large West European nations when measurements of actual broadband speeds are used, at least if the data from Akamai are a good indication of actual data throughputs experienced by consumers. To some extent, higher average speeds in the United States are driven by a larger tail of high-speed subscribers, reflecting greater deployment of FTTH, FTTN, and Cable DOCSIS 3.0 networks in the United States relative to many other nations. Again, however, the United States is some way behind the likes of Japan, Korea or even Sweden in advanced network deployment, although the explanations for this are many and varied. That said, on speed measures that we used, the U.S. performance was less than 50% of the Korean level.

Rank [*]	Country	Connectivity Score
1 [1]	Sweden	7.84
2 [2]	United States	7.82
3 [4]	Denmark	7.47
4 [5]	Netherlands	7.45
5 [3]	Norway	7.09
6 [8]	United Kingdom	7.06
7 [7]	Australia	6.93
8 [9]	Canada	6.88
9 [6]	Finland	6.78
10 [11]	Singapore	6.40
11 [15]	Belgium	6.31
12 [n/a]	Austria	6.27
13 [17]	Germany	6.27
14 [12]	Ireland	6.08
15 [18]	France	6.06
16 [10]	Japan	5.89
17 [16]	New Zealand	5.84
18 [13]	Korea	5.80
19 [20]	Spain	5.09
20 [19]	Czech Republic	4.93
21 [21]	Portugal	4.80
22 [22]	Italy	4.79
23 [23]	Hungary	4.50
24 [24]	Poland	4.26
25 [25]	Greece	4.22

*last year's rank in parenthesis

Table 2: Connectivity Scorecard 2011 Results – Innovation-driven Economies

Consumer usage

The United States is again one of the stronger performers on usage measures. The U.S. strength is driven by high levels of fixed voice and text message use (the country has the highest level of mobile voice usage of countries in the sample, and among the highest levels of text messaging use). The U.S. is not quite so strong on Internet use—while it is certainly above average, the roughly 60 percent of American adults who use the Internet every day contrasts with slightly higher proportions in Canada, Denmark, and Norway, for example. Available data on wireless Internet use also suggests that the U.S compares well with most European nations, but is eclipsed by a few, mainly Northern European, nations.

Business Infrastructure

On the business infrastructure indicators, the United States is the strongest performer, as it was in 2010. This strong U.S. performance is driven by substantial strength on nearly all the indicators that were used in this component for the 2011 Scorecard. Notably, the U.S. is at the top or very close to the top on measures of ICT investment per capita, enterprise telephony penetration and on a measure of the penetration of business mobile lines that are used for data transmission.[2] On other metrics, such as personal computer penetration (which is driven heavily by business adoption), secure Internet servers and the like, the U.S. is also a very strong performer, even if it does not quite make the top. One metric on which the U.S. does not perform well is in the use of new data protocols for business connectivity. The share of Ethernet and IP VPN revenues in all business connectivity revenues is significantly lower than the same share in the U.K. While such revenue shares might reflect differences in relative prices and demand elasticity for different types of connections, such a large difference might also reflect the fact that adoption of some of the latest data connectivity options has been hindered by the large U.S. installed base of subscribers who use "traditional" options such as T-1 lines.

Business usage and skills

On this component of the Scorecard, the U.S. performance is somewhat less strong than it is on the business infrastructure component. Of particular interest, especially on a forward-looking basis, is the human capital dimension to the U.S. performance on this component. The U.S. performs well on a measure of the proportion of the workforce that is composed of tertiary education graduates, but as mentioned in last year's Scorecard, the U.S. performance reflects its substantial prior lead in providing access to higher education. Thus older "cohorts" of the U.S. workforce are substantially more "skilled" than their counterparts in many other countries, but younger cohorts are only around average, at least if "skill" is measured by tertiary participation and completion rates. Further, the U.S. is a disappointing performer in a measure of Science and Engineering doctorate holders, finishing well below Sweden and the United Kingdom on this measure.

Public Sector Metrics

The United States government and its healthcare and education sectors are heavy spenders on hardware, software and computer services. A peculiarity of the United States is that a high proportion of healthcare services and also of tertiary education services are provided by the private sector, so one might argue that the metrics for the United States might reflect private investment to a substantial extent. Nonetheless, for ease of comparison, we have included all spending by the healthcare and education sectors under the "public metrics." A more fundamental question, one that we discuss subsequently in this report, relates to the productivity of ICT spending in the U.S. health and education sectors. In particular, while spending levels in healthcare as reported by WITSA's Digital Planet publication are strong, some other measures such as those compiled by the Information Technology and Innovation Foundation (ITIF) show that the U.S.' actual adoption of ICT in the healthcare sector is lacking, especially in the areas of communicating with patients and in the computerization of records.[3]

Of especial note in the United States, is the adoption of the National Broadband Plan which lays out strategies for improving the United States' performance in e-Health (among other efforts to improve the delivery of public-facing services). In particular, the plan discusses ways to get more medical records online and also recommends a path for allowing consumers the ability to access their health record information. Similarly, with respect to education, the Plan discusses efforts to induce copyright holders to make more educational materials available online at low cost.

Comparison of 2011 and 2010 results

The US scores 7.82 and finishes close behind Sweden in a virtual tie this year, unchanged from 2nd place last year when it scored 7.77. Two major factors drive the differences between 2010 and 2011 results for all countries. First, there is the effect of using new and updated weights for each of the components, and second, there is the effect of using new indicators. The effect of the weights on the U.S. performance (and indeed on the performance and rankings of most other comparable economies) is small. Had we used the same weights as we had used in 2010,

[2] Admittedly, "data" might include text messages, instant messages, email and Internet use. It is difficult, if not impossible, to obtain a more granular picture. Further, the definition of an "enterprise" line might also suffer from cross-country inconsistencies. However, despite these limitations, including such metrics is an important step for a composite index that aims to keep up with the rapid pace of change in the nature of technology and how people use that technology.

[3] See Daniel Castro, "Explaining IT Application Leadership Series: Health IT", September 2009. Information Technology and Innovation Foundation (ITIF), Washington DC.

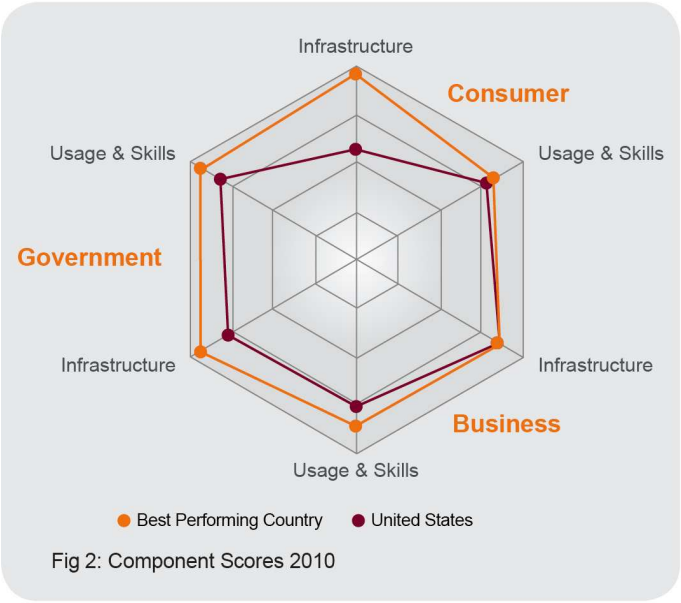

Fig 2: Component Scores 2010

the United States would have achieved a score of 7.91 but would have finished in first place. The effect of the new weights and the weighting system on overall scores is described in more detail in the Connectivity Scorecard 2011 report[4]. The effect of new indicators, however, is more substantial. The following factors are salient in explaining the (relatively small) differences between this year's U.S. performance and last year's:

- The U.S. improved its consumer infrastructure score relative to the top ranking countries (Japan and Korea), but this improvement in the U.S. score was part of a secular upward movement in scores of most countries. The addition of the "equalizing" metrics of fixed and wireless broadband coverage and unique user mobile penetration explains this;
- The U.S.' lacklustre performance in terms of producing science and engineering PhDs moderates its business usage and skills performance;
- The U.S. scores on government-related indicators stayed comparatively steady relative to many other countries. The inclusion of additional metrics on public sector or quasi-public-sector investments in IT hardware, software and IT services had the effect of creating additional dispersion in country scores, with some country scores on the "public" or "government" subcomponents falling substantially as a result of the inclusion of these metrics. The U.S. and some other countries did not experience this decline to anything like the same degree, and nor did Sweden or other countries that were typically in the top half-dozen of the Scorecard in previous years. Thus the effect of these new "public sector" indicators on the U.S. rankings was less pronounced than for other countries.

The Connectivity Scorecard is based on comparative scores between countries, and, therefore, each country's performance is measured in relation to the best performing nation in each component at a given point of time. As with other indices of relative rankings, it is therefore hard to interpret the Scorecard in terms of absolute "improvements" or "deteriorations" and to make comparisons of scores over time.

	2011 Score	2010 Score
Consumer Infrastructure	0.72	0.57
Consumer Usage and Skills	0.70	0.78
Business Infrastructure	0.86	0.86
Business Usage and Skills	0.68	0.77
Public Sector Infrastructure	0.75	0.79
Public Sector Usage and Skills	0.76	0.82

Table 3: Changes in Component Scores between 2010 and 2011

The Broader Context

ICT in the American economy

Among OECD countries, the United States has generally stood out because of the role of ICT in engendering productivity gains across the wider economy. Not only has the ICT sector grown in the United States, but firms in the wider economy—such as in the retailing and financial sector—have used ICT extensively to bolster productivity gains. In the 2000s, a large number of studies emerged that found that this U.S. productivity renaissance was driven by high levels of investment in ICT. The studies presented in Table 4 suggest that there was a substantial contribution of ICT to economic growth everywhere in the 1995-2000 period, but especially in the United States. In absolute terms, ICT was especially impactful in the U.S., Canada and the U.K., which all experienced rapid economic growth during that period; in relative terms, ICT contributed a large chunk of economic growth in an otherwise slow-growing Japanese economy.

For example, Ho, Jorgenson and Stiroh (2008)[5] found

[4] Available for download at www.connectivityscorecard.org

[5] Dale W. Jorgenson & Mun S. Ho & Kevin J. Stiroh, 2008. "A Retrospective Look at the U.S. Productivity Growth Resurgence," Journal of Economic Perspectives, American Economic Association, vol. 22(1), pages 3-24, Winter.

that 59% of U.S. labour productivity growth between 1995 and 2000 was attributable to ICT investment and usage, as was 38% of U.S. labour productivity growth between 2000 and 2006. Other countries did not seem to experience quite the same level of productivity increase from ICT. However, the contribution of ICT capital was still significant. Thus according to Van Ark et al (2008)[6] in the European Union over the period from 1995-2004, the increase in the stock of ICT capital contributed 0.5 percentage points per year to the growth of total GDP, compared to 0.8 percentage points in the United States. However, in the United Kingdom and Denmark, the increase in the stock of ICT capital contributed as much as 1 percentage point a year on average. Given that on average, GDP in the EU countries studied by Van Ark et al (2002) grew by 2.2 percent a year over the 1995-2004 period and that 0.5 percentage points of this growth were simply because of growth in hours worked, labour productivity increased by around 1.7 percentage points a year, of which 0.5 percentage points or nearly 1/3rd was contributed by the direct capital deepening effect of more investment in ICT.

In recent times, the American economy has been hurt by the financial crisis. Further, growth in consumer spending has moderated substantially over the past two years, leading to softer retail sales. The fact that financial services and retailing—two sectors in which ICT was suggested to have played a major role in generating productivity gains—have been reined back in the U.S. (and also the U.K.) economy has generated some interesting questions about the American productivity miracle of the middle 1990s onwards. Financial services output and retailing output might have over-expanded as a result of a "bubble" and in any case, output in services sectors is much harder to measure than output in goods-producing sectors. Some commentators have suggested both that the productivity gains in these sectors were overstated and that the economic impact of new technological innovations—embodied in the Internet—has been much different (if not necessarily weaker) than originally conceived. Some economists have suggested that off-shoring to lower-wage countries—a phenomenon that is greatly assisted by modern communications technology—is creating "phantom GDP" in the United States.[7] The effects of ICT on job creation have also been debated, as have the effects of ICT in terms of increasing the returns to education and benefitting higher-skilled workers while in direct and indirect ways reducing the pool of available jobs for lower-skilled workers.

The Great Stagnation

A new book, perhaps ironically available only electronically, addresses the perceived long-term stagnation of the U.S. economy. The "Great Stagnation" by economist Tyler Cowen argues that the U.S. economy has simply exhausted all of its easily available sources of growth – what he calls "low-hanging fruit" – and new forms of innovation such as the Internet have not had an impact on the macro-economy in quite the way one might expect. For example, Cowen points out that one hundred years ago, there were many high-ability people who might have failed to receive an education, and consequently contributed much less to business, science and the wider economy than they might have done were education more widely available. However, the United States has already tapped these "geniuses stuck on farms" by extending universal education and even tertiary education to much of its population many decades ago. Developing nations can still draw upon untapped pools of human capital, while the U.S. might only generate marginal economic gains from increasing its tertiary education participation rate.

Of most relevance, Cowen argues that the Internet has been great for consumers. It has greatly increased their "utility" and has indeed helped families and individuals navigate tough economic times without reducing their consumption by as much as they might have otherwise. Cowen argues that the sheer availability of vast amounts of free content and entertainment on the Internet, as well as the greater convenience level that the Internet engenders (for instance, new options for shopping and banking) have a substantial bearing on social and consumer well-being. On the other hand, he argues that many activities on the Internet generate little revenue, and that Internet companies simply do not generate the levels of employment that "old economy" firms such as General Motors used to generate. Indeed, one way of interpreting Cowen's argument is that while the real level of consumption (and hence GDP) has increased, employers and investors make decisions based on the revenues received and thus these higher real levels of

[6] Bart Van Ark, Mary O'Mahony and Marcel P. Timmer, 2008, "The Productivity Gap Between Europe and the United States: Causes and Trends", Journal of Economic Perspectives, American Economic Association, vol. 22(1), pages 25-44, Winter.

[7] See Mandel, Michael, "The Real Cost Of Offshoring", Business Week, June 18th, 2007.

consumption do not translate into more jobs or more output.

Relevance for the Connectivity Scorecard

One could argue that Cowen's hypotheses, if correct, have profound implications for the Connectivity Scorecard, and more broadly for other studies of ICT and its impacts. The premise behind the Scorecard is, roughly, that more ICT and more skills complementary to ICT are good things for economic growth. The Scorecard is also firmly aligned with the conventional literature on the role of ICT in generating increases in economic productivity—the belief that improved business productivity is the key to long-term increases in economic well-being are an important part of the Scorecard's weighting of consumer, business and public sector attributes. The Great Stagnation, with its provocative hypotheses that modern innovations such as the Internet have not produced the type of wider economic gains that earlier innovations such as electricity or railroads produced, seems to challenge conventional wisdom. The suggestion that the main gains from these innovations have been in the form of consumer benefits, not in fundamental transformation of the economy's productive capabilities, is also provocative.

At the same time, however, it should be remembered that there is no convincing and systematic evidence that the productivity gains of past years have been over-stated. More relevant, there is no detailed evidence describing the extent to which productivity and output in the "pre-crash" economy were overstated in sectors that are typically described as intensive users of ICT. In fact, the worst impact of the crisis has been on the housing and construction sectors, whereas other sectors show better prospects of returning to normal levels of growth. Indeed, by the end of 2009, construction sector output was about 18% lower than it was at its peak (in real chained 2005 dollars) whereas other sectors such as information processing, computer production, publishing, telecommunications and broadcasting all had higher output at the end of 2009 than at the end of 2006. The financial sector also registered net growth over this period. Retail trade had shrunk between 2006 and 2009, but unlike home buying and construction spending, retail spending has been recovering steadily if not strongly for the last 18 months.[8] In short, at least by conventional economic measures of output, the data suggest that ICT-intensive sectors suffered in common with other parts of the economy, but that they did not suffer unduly. There is no compelling evidence that the gains in retail, finance, and other ICT-using sectors were substantially illusory and will be "clawed back", anymore than there is for many other economic sectors, although there seems to be much stronger evidence for this when one looks at the constructions sector. Further, while one might question whether GDP itself is being correctly measured, there does not appear to be any widely accepted alternative accounting of economic gains. In short, the hypotheses about "phantom GDP" are just hypotheses.

Of course, the Internet (which is what Cowen mainly concentrates on) is simply the most vivid manifestation of the explosive development of ICT in recent years, but it is not the only component of ICT. In fact, by focusing the argument too narrowly on the Internet, Cowen might be overlooking the broader impact of computers, data processing equipment, software, IT services, and the like, all of which are captured in the "conventional" studies of the ICT impact upon productivity as conducted by researchers such as Jorgenson and his colleagues. With respect to the Internet and broadband technologies, some studies already show that there are significant economic gains from deployment of these technologies. Further, just as the impact of computers and other forms of "old" ICT took years to show up in the productivity statistics, it might well be the case that the impact of networked technologies such as broadband will show up more dramatically in the coming few years.

Broadly, the idea that the U.S. and other advanced countries have run out of sources of growth because innovation has stagnated is an interesting one; but it is not an idea that can be verified at this point in time. Similarly, the challenges to conventional wisdom regarding the measurement of output and productivity (and the role of ICT in boosting output and productivity) should be welcomed, but it should also be recognized that well-defined alternative economic measures or even theoretical constructs seem thin on the ground. For these reasons, we think that there is no reason to fundamentally question the important role that we and others have assigned to ICT in determining the future path of economic growth in developed countries such as the United States.

About Connectivity Scorecard

The Connectivity Scorecard is a global ICT index which, unlike other available research, is the first of its kind to rank countries in terms of "useful connectivity". That is, not only on the deployment of ICT infrastructure but also

[8] Source: Bureau of Economic Analysis, Industry Accounts Data, http://www.bea.gov/industry/iedguide.htm#gpo.

Country/Study	Overall Economic Growth Rate	Percentage Point Contribution of ICT	ICT Contribution to Economic Growth	Period
France				
Cette el (2002)	2.20%	0.3	14%	1995-2000
United Kingdom				
Oulton (2001)	3.10%	0.6	19%	1995-2000
London Economics	3.20%	0.8	25%	1992-2000
Australia				
Simon and Wardrop (2001)	4.90%	1.3	27%	1992-2000
Korea				
Kim (2002)	5.00%	1.2	24%	1995-2000
Canada				
Armstrong et al (2002)	4.90%	0.7	14%	1995-2000
Khan and Santos (2002)	4.75%	0.5	11%	1995-2000
United States				
Jorgenson et al (2002)	4.60%	1.3	28%	1995-2000
Pakko (2002)	4.30%	0.8	19%	1995-2000
Japan				
Motohashi (2002)	1.50%	0.5	33%	1995-2000
Germany				
RWI and Gordon (2002)	2.50%	0.5	20%	1995-2000

Table 4: Historic evidence on ICT Contribution to Growth

to measure the extent to which consumers, businesses and the public sector “make use” of connectivity technologies to enhance social and economic prosperity. This "useful connectivity" is defined as the bundle of infrastructure, complementary skills, software and informed usage that makes ICT the key driver of productivity and economic growth.

Commissioned by Nokia Siemens Networks, the study was created by Professor Leonard Waverman, Dean, Haskayne School of Business, University of Calgary, and Fellow, London Business School. The study was conducted by the consulting firms Berkeley Research Group and Communicea.

For more information on the Connectivity Scorecard, visit www.connectivityscorecard.org

Business Contact

Kim Jones
Nokia Siemens Networks
kim.jones@nsn.com

Media Contacts

Riitta Mard, Media Relations
Nokia Siemens Networks
riitta.mard@nsn.com

Carol Dematteo, Communications
Nokia Siemens Networks
carol.dematteo@nsn.com