	Score	Weight
Consumer Infrastructure	0.22 (0.88)*	0.13
Consumer Usage and Skills	0.29 (0.70)*	0.13
Business Infrastructure	0.04 (0.64)*	0.56
Business Usage and Skills	0.20 (0.71)*	0.12
Public sector Infrastructure	0.18 (0.83)*	0.05
Public sector Usage and Skills	0.13 (0.68)*	0.01

*The score of the leading performer for this component

Table 1: Component Scores & Weights 2011

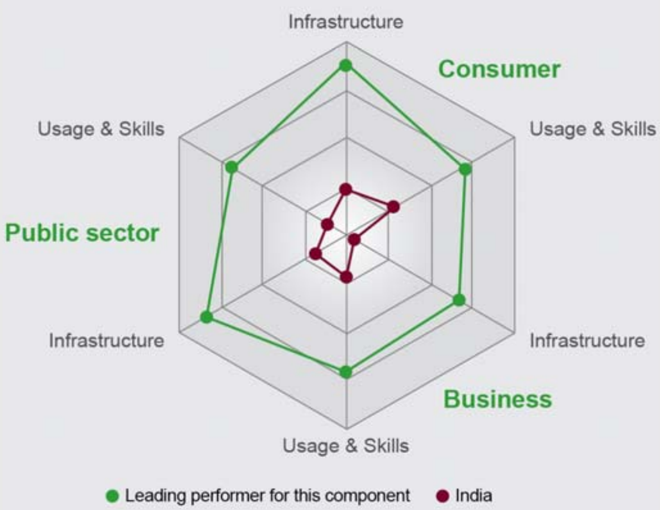


Fig 1: Component Scores 2011

Connectivity Scorecard 2011

India

Overview performance

With a score of 1.25, India retains its ranking of 21st amongst the resource and efficiency-driven[1] economies on the Connectivity Scorecard 2011. In 2010, India also finished 21st but with a higher score of 1.82. The fundamentals of India's performance have changed very little, and the fall in the score (although not the ranking) is due to the inclusion of new indicators and new weights that affected the relative performance of all countries. India's high global profile in ICT is reflected in an unusually high score for the level of ICT services exports per capita, however the underlying gaps in broadband penetration and other forms of basic ICT, despite ongoing expansion in mobile penetration and relatively high levels of use among existing mobile subscribers, are clearly visible in the 2011 Connectivity Scorecard results as they were in previous editions of the Scorecard.

Strengths and weaknesses

India's major strength is reflected in a measure that was used as a proxy for the domestic availability of ICT skills. India has the highest level of ICT exports per capita in the sample of resource and efficiency economies. This reflects both high-value-added and low-value-added services, but it should not be assumed that these services exports are all "call centres" as there is a substantial layer of very sophisticated Indian companies that export higher-end ICT services too. In absolute terms, India has a large cadre of very highly skilled and/or ICT-literate workers, even if it lags behind on a per capita basis. But the large absolute numbers of skilled workers give India the advantage of scale, and thus make it a preferred hub for many ICT activities, including R&D.

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

Detailed discussion

Consumer infrastructure

On this component, India registers a score of 0.22. India performs modestly or poorly on almost all fronts. The reality is that compared to its BRIC peers, India's infrastructure requires a major improvement. For example, India's broadband penetration rate (measured as subscribers per 100 households) is around an eighth of the rate achieved in China. Even on mobile penetration, India is still substantially behind many other countries, especially Latin American countries. This is true whether one looks at the "SIM cards per 100 persons" measure of mobile penetration, or whether one looks at the "unique user" penetration.[2]

Consumer usage

Although mobile minutes per subscriber in India are quite high compared to most other R&E economies, and indeed compared to most innovation economies, this is not true when one measures *minutes per capita.* India also suffers because its adult literacy rate has yet to rise to the level of China or the Latin American nations.

Business Infrastructure and Business usage and skills

On virtually all metrics, ranging from personal computer penetration to enterprise spending on software and hardware, India is among the handful of least well-performing countries. There are virtually no redeeming features. A point of interest is that the reoprt includes ICT goods exports as a proxy measure for ICT diffusion and investment in this year's Scorecard, which is discussed later in this report, and India is not a substantial exporter of ICT goods. This may reflect the fact that most ICT goods production is for domestic consumption. However it also possibly highlights a disadvantage that India faces in that it does not have the ICT production chains that countries like Thailand, China and Malaysia possess, along with the potential spill-over advantages that such chains might bring. Indeed, while the ICT services sector can provide jobs for the educated classes, the type of manufacturing that China is able to attract and ultimately transfer into domestic firms provides jobs for a broader range of workers, which is not an irrelevant consideration in a developing economy.

India's performance on virtually all measures of business usage is extremely poor, with one exception. This is ICT services exports, a new metric that was included in this year's Scorecard for the first time. On other measures, such as business spending on IT services, that is, spending by *domestic* businesses on IT services, India's performance is again very weak.

Rank [*]	Country	Connectivity Score
1 [1]	Malaysia	6.61
2 [3]	Chile	6.21
3 [5]	Russia	5.68
4 [7]	Turkey	5.51
5 [4]	Argentina	5.46
6 [6]	Brazil	5.14
7 [8]	Mexico	4.87
8 [10]	Ukraine	4.81
9 [2]	South Africa	4.68
10 [9]	Colombia	4.06
11 [12]	Thailand	3.68
12 [13]	Tunisia	2.79
13 [15]	Vietnam	2.73
14 [17]	China	2.72
15 [14]	Iran	2.41
16 [19]	Philippines	2.15
17 [n/a]	Syria	2.11
18 [20]	Indonesia	2.01
19 [16]	Sri Lanka	2.01
20 [18]	Egypt	1.89
21 [21]	India	1.25
22 [25]	Pakistan	1.14
23 [23]	Nigeria	1.09
24 [22]	Kenya	0.95
25 [24]	Bangladesh	0.90

*last year's rank in parenthesis

Table 2: Connectivity Scorecard 2011 Results – Resource & Efficiency-driven Economies

Owing to data constraints relating to other indicators in the business infrastructure and business usage and skills components, data was included on ICT exports of goods (under infrastructure), and ICT imports of goods and exports of services (under usage). The reason for these seemingly idiosyncratic choices is as follows: high levels of ICT exports are likely to be quite correlated with the development of a reasonably strong ICT ecosystem. Similar to the car industry, ICT manufacturing in one area is likely to spawn spill-over effects into ICT in other manufacturing and ICT investment in complementary areas. For instance, an initial advantage in computer assembly might lead to the location of mobile handset assembly in the country. This in turn will likely have positive spill-over effects into the wider economy.

[2] For the R&E economies, both measures of penetration are included. This is because there was missing data on mobile unique users penetration for several R&E economies, whereas the usual "SIM Cards per 100 population data" were available for all countries. It seemed remiss not to include at least one available measure of mobile penetration for each country.

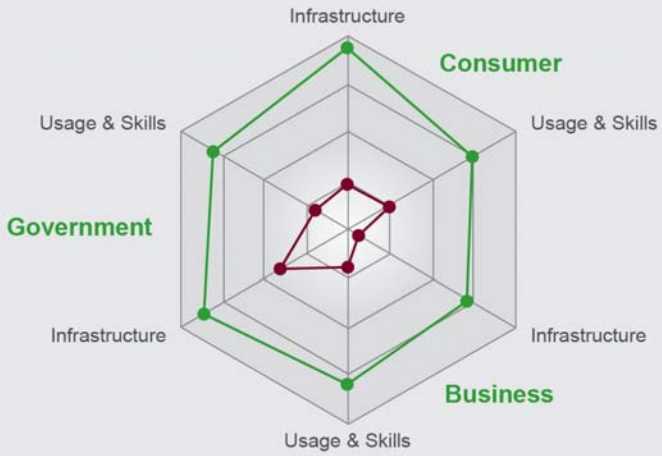


Fig 2: Component Scores 2010

However, not all countries are ICT exporters or need to have ICT or export-led growth strategies. Here high levels of ICT imports might suggest a high level of domestic demand for ICT and thus be correlated with high levels of usage.[3] High levels of ICT service exports are very likely to correlate with the presence of a critical mass of ICT user skills in the economy, which in turn could enable countries to support strong ICT sectors despite large sections of the population without ICT skills. Such is the case for India. However, in terms of ICT goods exports and imports, India suffers because of the large lead of Malaysia in these measures comparative to other nations.

Public Sector Components

India's performance on public sector spending metrics, as manifested in WITSA Digital Planet data on spending by the government, healthcare and educational sectors matches its weak performance on the business spending metrics that were used. However, the United Nations' e-government rankings and their subcomponents, which were used in this year's Scorecard, are less harsh on India in the sense that the difference between India and the leading countries is less pronounced on this measure than on other measures.

Comparison of 2011 and 2010 results

In 2010, India also finished in 21st place but with a score of 1.82, vs 1.25 this year. For the Resource and Efficiency economies, two major differences drive the difference in scores and rankings this year[4]. First, there is the use of new weights that have a particular effect on the split between "infrastructure" and "usage and skills" in the business and government components of the Scorecard. Using Conference Board data it was possible to obtain weights specifically for the relative contributions of ICT capital and labour force improvements to economic growth, from which the split between infrastructure (capital) and usage and skills is derived. In general, this change has resulted in more weight put on the "business infrastructure" component than in previous Scorecards.

Further, the inclusion of new indicators has made a significant difference to countries' relative performance on the business components of the Scorecard. This, however, has been discussed in detail above.

Had the 2010 weights been used, India would have scored 1.81, since more weight would have been put on business usage relative to business infrastructure. Further, the difference in scores on different components of the Scorecard is shown in Table 3.

	2011 Score	2010 Score
Consumer Infrastructure	0.22	0.24
Consumer Usage and Skills	0.29	0.25
Business Infrastructure	0.04	0.06
Business Usage and Skills	0.20	0.18
Public Sector Infrastructure	0.18	0.39
Public Sector Usage and Skills	0.13	0.21

Table 3: Changes in Component Scores between 2010 and 2011

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 Connectivity Scorecard in terms of absolute "improvements" or "deteriorations" and to make comparisons of scores over time.

[3] In fact, a good argument could be made that the "ICT imports" indicator should be stuck under the "business infrastructure" category since they could also be correlated with business investment. This does not, however, make much of a difference to the overall scores.

[4] For more information download the Connectivity Scorecard 2011 Report from www.connectivityscorecard.org

The Broader Context

Encouraging investment in infrastructure in India: the regulatory environment
India's "problems" are relatively more straightforward than those of other nations. For example, when analysing Japan or Korea, one must contrast their excellent infrastructure with the results of published studies on ICT usage in enterprises, particularly in the services sector. In India, the first basic problem, that of providing up-to-date infrastructure, has not fully been solved. For this reason, it might be informative to dwell upon the role that telecom regulation can play in solving the infrastructure problem.

In recent years, the country has made substantial progress in mobile uptake and especially in mobile usage. Competition has driven down per-minute voice prices to the lowest in the world. But all of this progress is not without a price, and there are considerable uncertainties about the future. There has arguably been too much entry into the Indian telecoms business, and there has been too little spectrum allocated. Figure 3 shows the amount of licensed spectrum in India in comparative international perspective.

Further, policies such as spectrum caps could have the effect of constraining efficient expansion by mobile operators. Firms can expand output either by spending more capital or by acquiring more spectrum. Basic economics suggest that there is some point at which (both from the perspective of the operator and from the perspective of society which must decide how to allocate the relatively scarce resource of spectrum) it is more efficient to expand using more spectrum than by using more capital. But India has historically micro-managed spectrum and imposed stricter caps on how much spectrum any one operator can own. As a report for the GSM Association noted in 2009:

> "India presents an extreme example of detailed spectrum management or micro-management by a regulator. Uniquely additional spectrum in this country is attributed to an operator on the basis of its number of subscribers. Furthermore, the total spectrum which a 2G operator can hold is linked to the technology it uses on the basis of the supposed spectrum efficiency of that technology. Current 2G spectrum caps are 15 MHz/GSM operator and 7.5MHz/CDMA operator (earlier proposals were 7.2 MHz and 5MHz respectively), on the grounds that CDMA technology is more spectrally efficient than GSM. Additional spectrum within the caps is attributed in 0.8 and 1 MHz "chunks" (previously 1, 2, 2.4, and 2.6 MHz) when specified subscriber thresholds are reached.[5] "

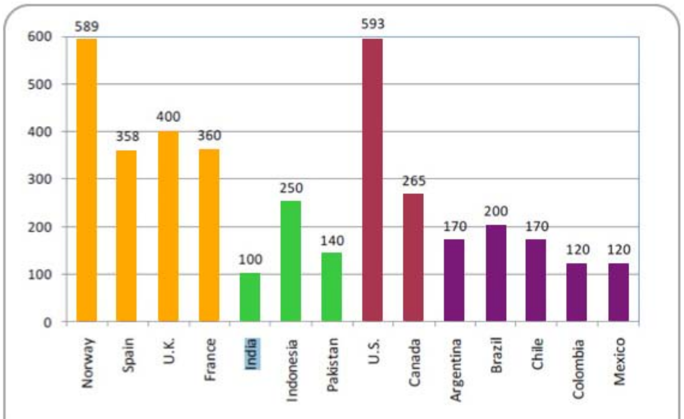
Indeed, in India, one can argue that the government might be penalising the most successful operators, as those with more minutes of use (and eventually more data usage, when data service volume reaches critical levels) will be the first to experience congestion on their networks. Further, the Indian spectrum allocation process might need to be reconsidered.

A mounting body of economic literature suggests that the goal of spectrum auctions should not be to raise revenue for the government, but to result in the highest possible levels of investment and deployment that result from the availability of that spectrum. In some circumstances, this might mean encouraging more entry and competition, but in the Indian case, given that there is a potential problem of too many entrants, many of which may lack sufficient scale to be viable and continue making investments in the long-run, the focus should be on making as much spectrum available as possible. However, in India spectrum auctions for 3G services were held up because of revenue-generation concerns on the part of the government, resulting in a substantial delay in the provision of mobile broadband services. These services should not be considered luxuries or high-end services. Given the paucity of fixed broadband in India, and the emergence of portable broadband devices that are much simpler to use than personal computers, it would seem logical to imagine that mobile broadband services would help to fill in the broadband gap in India in the same way that mobile voice services have done for voice.

Further, while the allegations of corruption and lack of transparency in the allocation of 2G licenses are a significant problem for India's credibility by themselves, there could also be problems associated with the government's efforts to claim back its estimated losses from the industry. This could impose a significant and unexpected financial burden on firms, and by weakening their financial position, could further reduce their ability to efficiently invest and expand services. In Europe, for instance, firms (largely through their own over-optimism) overpaid for spectrum licenses, and as a result found themselves financially constrained for years. In Europe's case, this contributed to a loss of the leadership that Europe had established in mobile telephony during the "2G" era. In India's case, regulatory uncertainty and perceived opportunism, coupled with a spectrum allocation policy that emphasises revenue-generation, can have much more serious consequences for

[5] See Roetter, Martyn F., "Mobile Broadband, Competition and Spectrum Caps", Independent Report for GSM Association, 2009. Available at http://www.asocel.org.co/pdf/Spectrum_Caps_Report.pdf.

investment and particularly for consumers. This is particularly true for investment by foreign operators who have access to cutting-edge technology.



Source: GSMA based on Arthur D. Little (2009), Plum, KB Enterprises LLC.

Notes: * India's value is the average per circle 2G. Pakistan's value is only for 2G services.

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 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, Marketing & Corporate Affairs
Nokia Siemens Networks
kim.jones@nsn.com

Media Contacts

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

Shudeep Majumdar, Communications
Nokia Siemens Networks
shudeep.majumdar@nsn.com