Number of Internet Users: Measuring Digital Access Progress in Economically Developing Countries

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Abstract

The percentage of Internet users in economically developing countries rose from 2% to 27% in the last decade. Eighty percent of the 25 fastest growing countries in the number of Internet users in 2004 were economically developing countries. This digital access progress in economically developing countries is a positive turnaround from a decade ago. While Internet users per 100 inhabitants indicates digital access progress in economically developed countries it falls short in understanding progress in economically developing countries. Instead we found the total number of Internet users a better measure for understanding progress in economically developing countries. We recommend that future digital access index calculations to incorporate the total number of Internet users to account for economically developing country’s progress in digital access.

Keywords: Economically developing country, developing country, Internet users

Introduction

Internet users in economically developing countries increased 300-fold in the last decade. In 1995 economically developing countries accounted for only 2% of the global Internet users. Today, they account for 27% of the global Internet user community. Internet users in economically developing countries increased from 785 thousand in 1995 to 234 million in 2004. In 1995 the 109 economically developing countries had a combined total of 785,000 Internet users with India accounting for 32% (250,000 Internet users). In 2004 eighty percent of the 25 fastest growing countries in the number of Internet users were economically developing countries. This marks a major progress from the status quo a decade ago: “The good news is the Internet is growing like a weed, … the bad news is it is almost unknown in the [economically] developing nations” (Press, 1996, p1).

Many researchers have highlighted the common reasons for digital access lag in economically developing countries: regulation (Wallsten, 2005); government policy (Hawkins and Hawkins, 2003); lack of local Internet hosts (Petrazzine and Kibati, 1999; Kamssu, Siekpe, and Ellzy, 2004); Internet access cost (Hesselmark, 2003); and high access cost to international backbone (Petrazzine and Kibati, 1999). Cost of Internet access in economically developing countries were found to be as high as 400% of the average per capita income compared to about 1% in economically developed countries (Hesselmark, 2003). Many of the Internet hosts used by economically developing countries are not local (Petrazzine and Kibati, 1999; Kamssu, Siekpe, and Ellzy, 2004); this limits the amount of local content development. The high access cost to international backbone also contributes to the high Internet access cost (Petrazzine and Kibati, 1999). These findings are serious problems that need to be addressed.

It is important to recognize these challenges. It is also important to recognize progress to inform policy makers on what works for economically developing countries and to establish best practices. Some researchers found progress in Internet diffusion in economically developing countries in spite of these economic and infrastructure challenges (Mbarika, Jensen, and Meso, 2002).
Researchers have proposed different indexes to measure digital access. Internet connectedness index (Jung, Qiu, and
Kim, 2001) and digital access index (ITU, 2003). The Digital Access Index (DAI) by ITU (International
Telecommunication Union) ranked 180 countries to determine their level of digital access (ITU, 2003).

ITU categorized the 180 countries in four DAI groups: low, medium, upper, and high; DAI index below 0.29, 0.30-
0.49, 0.50-0.69, and above 0.70, respectively. Ninety-three percent of the 115 countries that ranked below 0.50 in
the DAI index were economically developing countries. Ninety-seven percent of the 65 countries that ranked above
0.50 in the DAI index were economically developed countries. All 24 OECD (Organization for Economic Co-
operation and Development) member countries scored above 0.70 on the DAI scale. The ITU finding parallels the
digital divide, with economically developing countries lagging behind in digital access.

ITU used eight factors to calculate DAI: fixed telephone subscribers per 100 inhabitants; mobile cellular subscribers
per 100 inhabitants; Internet access price as percentage of GNI per capita; adult literacy; combined primary,
secondary and tertiary school enrollment level; international Internet bandwidth (bits) per capita; broadband
subscribers per 100 inhabitants; and Internet users per 100 inhabitants. Based on these eight factors ITU reported
(ITU, 2003) that 65 countries scored above 0.50 in the DAI score, hence categorized as upper or high access
countries.

This paper ranked the same countries in the ITU report (ITU, 2003) using the 2002 Internet users per 100
inhabitants, one of the factors used for calculating DAI. The result showed 60 out of the 65 countries (over 92%)
that scored above DAI 0.50 still ranked in the top 65. Only five countries (American Samoa, Trinidad, Grenada,
Brazil, and Russia) ranked behind countries with lower DAI score. This indicates that Internet users per 100
inhabitants as a strong predictor of the DAI. When we ranked countries based on total number of Internet users,
however, the rank order of countries changed significantly, favoring economically developing countries. Is Internet
user per 100 inhabitants a good indicator to assess digital access progress in economically developing countries?
Should we use total number of Internet users instead of Internet users per 100 inhabitants to better understand digital
access progress in economically developing countries? To address these questions this paper focuses on the research
question: Which of the two measure, Internet users per 100 inhabitants or total number of Internet users, is a better
indicator to understand digital access progress in economically developing countries?

Methods

We compared data from 176 countries over 10 years using the two measures: Internet users per 100 inhabitants and
total number of Internet users. Data for Internet users were taken from the 2005 World Telecommunication Indicator
database by ITU. The ITU database contained annual time series data from 1975-2004 with 102 sets of
telecommunication statistics for over 200 economies (ITU, 2005a). “The data are collected from an annual
questionnaire sent out by the Telecommunication Development Bureau (BDT) of the ITU. Additional data are
obtained from reports provided by telecommunication ministries, regulators and operators and from ITU staff
reports.” (ITU, 2005a, 2005b). The ITU report (ITU, 2003) used 180 countries. Data for four countries was not
found in our database; therefore only 176 countries were analyzed in this paper.

Classification for economically developing/developed countries was taken from the 2005 World Bank classification
(World Bank, 2005a). The main economic classification criterion was the 2004 gross national income (GNI) per
capita. The groups were low income, GNI $825 or less; lower middle income, GNI $826 - $3,255; upper middle
income, GNI $3,256 - $10,065; and higher income, GNI $10,066 or more (World Bank, 2005b). Based on the World
Bank classification 109 countries, 59 low income countries and 54 lower middle income countries were grouped as
economically developing countries for this study. Table listing the economically developing countries was omitted
due to space limitation.

We used the 2004 data from the ITU database and created two separate ranking for 176 countries. The first ranking
was based on Internet users per 100 inhabitants and the second ranking was based on total number of Internet users.
We then compared the rank difference using the two approaches. Additional analysis for the 176 countries was done

Data analysis only for selected countries is shown in this paper due to space limitation. The criteria used to select the
sample countries were: data availability, regional representation, size of population, and representation of DAI
levels. To represent economically developing regions three countries from Sub-Saharan Africa and three Asian
countries were selected. To understand the impact of total number of Internet users’, countries with largest
population size from Sub-Saharan Africa and Asia were selected. However, in the case of Sub-Saharan Africa the
third populous nation, The Democratic Republic of Congo, did not have data for 2003 and 2004. Therefore the fourth populous Sub-Saharan African nation, Tanzania, was used instead. The selected six countries represent low DAI (DAI below .29) and medium DAI (DAI 0.30 to 0.49) groups: Ethiopia (DAI=0.1), Nigeria (DAI=.15), Tanzania (DAI=.15), India (DAI=.32), Indonesia (DAI=.34), and China (DAI=.43). The United States (DAI=.78), global leader in number of Internet users, is selected as a benchmark.

**Results**

The ranking based on Internet users per 100 inhabitants for 2004 showed similar results as the 2002 DAI ranking; 59 of the 65 countries that had DAI score above 0.50 still rank in the top 65. Only three economically developing countries (Belarus, Guyana, and Romania) with DAI score under 0.5 ranked in the top 65 list in 2004. This result indicates that economically developing countries did not make much progress in digital access between 2002 and 2004. However, results based on total number of Internet users revealed progress in economically developing countries.

The ranking based on total Internet users for 2004 had 22 countries with DAI score below 0.50 that ranked in the top 65. This indicates more digital access progress in economically developing countries. When ranked by total Internet users almost all economically developing countries show progress during the decade under study (1995 to 2004). Sixty-two out of the 109 economically developing countries, 57%, improved their ranking by at least 20 positions each. This progress is represented in our sample countries, Table 1.

<table>
<thead>
<tr>
<th>Country Name</th>
<th>Economy 1</th>
<th>Total users 2</th>
<th>Per 100 users 3</th>
<th>Rank per 100 4</th>
<th>Rank total 5</th>
<th>Change 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>D</td>
<td>185,000,000</td>
<td>62.3</td>
<td>12</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>China</td>
<td>B</td>
<td>94,000,000</td>
<td>7.2</td>
<td>103</td>
<td>2</td>
<td>101</td>
</tr>
<tr>
<td>India</td>
<td>A</td>
<td>35,000,000</td>
<td>3.2</td>
<td>123</td>
<td>6</td>
<td>117</td>
</tr>
<tr>
<td>Indonesia</td>
<td>B</td>
<td>14,508,000</td>
<td>6.5</td>
<td>92</td>
<td>13</td>
<td>79</td>
</tr>
<tr>
<td>Nigeria</td>
<td>A</td>
<td>1,769,661</td>
<td>1.4</td>
<td>139</td>
<td>53</td>
<td>86</td>
</tr>
<tr>
<td>Tanzania</td>
<td>A</td>
<td>330,000</td>
<td>0.9</td>
<td>149</td>
<td>88</td>
<td>61</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>A</td>
<td>113,000</td>
<td>0.2</td>
<td>172</td>
<td>125</td>
<td>47</td>
</tr>
</tbody>
</table>

1 economic classification: A = Low-income economies; B = Lower-middle-income economies; C = Upper-middle-income economies; D = high income economy
2 Total users: total number of Internet users for 2004
3 per 100 users: number of Internet users per 100 inhabitants for 2004
4 Rank per 100: country ranking based on number of Internet users per 100 inhabitants; 1 being the highest
5 Rank total: country ranking ordered by highest number of total Internet users, 1 being the highest
6 Change: change in rank between total users and per 100 users rank

**Table 2: 10 Year Data for Number of Internet Users in Selected Countries (thousands)**

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>Ethiopia</th>
<th>India</th>
<th>Indonesia</th>
<th>Nigeria</th>
<th>Tanzania</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>60</td>
<td>0</td>
<td>250</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>25,000</td>
</tr>
<tr>
<td>1996</td>
<td>160</td>
<td>1</td>
<td>450</td>
<td>110</td>
<td>10</td>
<td>1</td>
<td>45,000</td>
</tr>
<tr>
<td>1997</td>
<td>400</td>
<td>3</td>
<td>700</td>
<td>384</td>
<td>20</td>
<td>2</td>
<td>60,000</td>
</tr>
<tr>
<td>1998</td>
<td>2,100</td>
<td>6</td>
<td>1,400</td>
<td>510</td>
<td>30</td>
<td>3</td>
<td>84,600</td>
</tr>
<tr>
<td>1999</td>
<td>8,900</td>
<td>8</td>
<td>2,800</td>
<td>900</td>
<td>50</td>
<td>25</td>
<td>102,000</td>
</tr>
<tr>
<td>2000</td>
<td>22,500</td>
<td>10</td>
<td>5,500</td>
<td>1,900</td>
<td>80</td>
<td>40</td>
<td>124,000</td>
</tr>
<tr>
<td>2001</td>
<td>33,700</td>
<td>25</td>
<td>7,000</td>
<td>4,200</td>
<td>115</td>
<td>60</td>
<td>142,000</td>
</tr>
<tr>
<td>2002</td>
<td>59,100</td>
<td>50</td>
<td>16,600</td>
<td>4,500</td>
<td>420</td>
<td>80</td>
<td>159,000</td>
</tr>
<tr>
<td>2003</td>
<td>79,500</td>
<td>75</td>
<td>18,500</td>
<td>8,080</td>
<td>750</td>
<td>250</td>
<td>162,000</td>
</tr>
<tr>
<td>2004</td>
<td>94,000</td>
<td>113</td>
<td>35,000</td>
<td>14,500</td>
<td>1,770</td>
<td>333</td>
<td>185,000</td>
</tr>
</tbody>
</table>
As shown in Table 1, China’s ranking changed by 101 positions, from 103rd to 2nd place. China has the second largest Internet users globally, second only to the United States. This high level of digital access penetration in China was not obvious when using Internet users per 100 inhabitants ranking. India’s progress in the digital access is also highlighted by its 6th rank in total number of Internet users, improved position by 117 from its 139th place. The rank also changed favorably for Indonesia, Nigeria, Tanzania, and Ethiopia where ranking improved by 79, 86, 61, and 47, respectively. When compared using total number of Internet users China has more Internet users than the 17 OECD countries combined; India has more Internet users than the 12 OECD countries combined; and Nigeria has more Internet users than the combined Internet users in 3 of the OECD countries.

The 10 year total number of Internet users trend for the selected countries is shown in Table 2. Prior to 2000 the number of Internet users in many of the economically developing countries was non existent. The combined total number of Internet users in the six selected countries, see Table 2, was less than the 1995 number of Internet users in the United States. Economically developing countries, however, began to show accelerated progress between 2001 and 2004. Graphical representation for total Internet users’ trend is shown in Figure 1 and 2.

**Figure 1: Trend for total Internet users**

**Figure 2: Logarithmic trend for total Internet users**

Figure 1 shows that three of our selected countries showed significant improvement in the number of Internet users in the last five years. When placed on the same scale it is difficult to see level of Internet users progress in many of the economically developing countries. In Figure 2 we used a logarithmic function to evaluate individual country
progress. The logarithmic function provides a scale that highlights the overall trend for each country. The rate of growth in economically developing countries, shown in Figure 2, is encouraging.

Discussion

Internet users per 100 inhabitants clearly indicated digital access lag in economically developing countries. By 2004 none of the selected countries had reached the 9.4% penetration the United States had in 1995. In fact, by 2004 only five economically developing countries (Romania, Brazil, Morocco, Peru, and Thailand; listed in order of highest to lowest penetration rate) had exceeded the 9.4% penetration level the U.S. had 10 years ago. This lag is reflected in the digital divide and must be addressed. However, the Internet users per 100 inhabitants measure overlooks the progress being made in economically developing countries. The total number of Internet users measure provides better understanding regarding Internet user level in economically developing countries.

The number of Internet users count in this study is based on the number of subscribers from ISP providers. Number of Internet users based on subscriber from ISP provider undercounts individuals that use Internet café and share access from friends; both methods common in economically developing countries (Mbarika, Jensen, and Meso, 2002; Petrazzini and Kibati, 1999). Accounting for Internet café users and shared access will increase the number of Internet users in economically developing countries. This may reveal stronger progress than presented in this paper. Future studies should look at better ways to count the number of Internet users in economically developing countries.

While Internet users per 100 inhabitants is a good measure for understanding the national penetration rate it does not tell us the whole picture. Progress in countries with larger populations is particularly overlooked when using the Internet users per 100 inhabitant measure. Total number of Internet users on the other hand provides a direct indication of how much internet activity exists in the country. For example, 50 Internet users per 100 inhabitants for a country with 1,000 inhabitants (500 active Internet users) is smaller than 10 Internet users per 100 inhabitants for a country with 10,000 inhabitants (1,000 active Internet users).

Conclusion

We found total number of Internet users a better measure for understanding progress in economically developing countries. While Internet users per 100 inhabitants indicate digital access progress in economically developed countries it falls short in understanding progress in economically developing countries. Our finding is supported by other researchers who found that the digital divide measures do not reflect progress made in economically developing countries; “usage access measure is based (often implicitly) on the circumstances prevailing in the [economically] developed countries” (James, 2004, p174).

The growing number of Internet users in economically developing countries, 94 million in China, 35 million in India, 15 million in Indonesia, and almost 2 million in Nigeria is encouraging. This progress in the number of Internet users may increase the market potential and e-commerce (Yang and Miao, 2005). Best practices from these countries should be further studied to understand digital access in economically developing countries. In India for example, researchers have found that more people benefited from the digital access through intermediaries than a direct access (James, 2004).

The digital access lag of economically developing countries is firmly established in the literature. Understanding areas of weakness and strength is important for policy makers. Recognizing areas of progress builds on existing strength. Despite the economic and infrastructure challenges economically developing countries are making progress. Our finding supports other researchers that found progress in Internet diffusion in economically developing countries in spite of economic and infrastructure challenges (Mbarika, Jensen, and Meso, 2002).

This study looked at 10 year global trend for Internet users and found encouraging progress in economically developing countries. Our findings suggest that economically developing countries are making positive progress towards increasing the number of Internet users. To understand the progress made in economically developing countries we recommend that future digital access index calculations to incorporate the total number of Internet users.
References


