# Trends in Digital Divide

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November 2000

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# Trends in ICTs for Human Development: Digital Divide

## 1. Introduction

Information and communication technologies (ICT) have the potential to offer vast advantages to users. ICT could bring broad and in-depth information to those who have been hitherto denied such knowledge and thus opportunities for social and economic mobility. It could open up new possibilities for more transparent and inclusive public administration/governance everywhere by opening up direct channels to the arenas of decision making, and by engendering a proliferation of public spheres and stronger civil-society networks brought together by the "death of distance". It could become the engine of redistribution of knowledge and expertise in the areas of education and public health from the centers of production in the metropoles of the North to the remote corners of the earth. It could pave the way for an inclusive economic sphere by lowering entry barriers for e-commerce and provide two-way flow of goods knowledge and ideas to any and all.

This potential for human development is aided by the significant strides in the technology sector. Development of packet switching technologies in the early 60's, have allowed the simultaneous transmission of audio, video and data signals on common multi-purpose digital platforms. The gigabit range bandwidth capacity enabled by fiber-optic technology and the exponential increase in affordable computing power that could be packed in a chip have proliferated multi-media applications for information delivery. The innovation of hypertext markup language and the WWW in the early 90's have transformed our ability to retrieve information over the Internet in accessible way much easier. The most recent advances in satellite and wireless technologies make the penetration of the ICTs to areas without the infrastructure for conventional technologies.

The potential of ICTs and their capacity to help human development need not automatically translate into realization of this potential. Institutional innovations to adopt ICTs to local needs, creative partnerships to share expertise and finances, enlightened national and global policy regimes to provide sustainable macroeconomic and legal framework are some of the necessary inputs to realize the potential of the Internet. However, analysis of these factors is beyond the scope of this paper. In this paper, we shall explore some metrics that can be used to identify the Internet haves and have-nots. We shall explore the trends in this divide, and the context in which the trends occur to verify if these differences constitute a divide or they simply reflect a different rate of convergence.

## 2. Growth of Internet

Internet use has grown at an unprecedented rate. In Table 2-1 (see below) the penetration rate of Internet use in the U.S. is compared to the adoption rate of other technologies. Since population size varies at different time periods, penetration is presented in terms of the percentage of population using Internet rather than the absolute number of users. As can be seen, the Internet has penetrated more than five times faster than telephone and more than twice as fast as Television.

**Table 2-1: Length of Time to Reach 30% Penetration in US**
(Source: US Internet Council, April 1999)

| Technology | No. of Years to Reach 30% Penetration |
|---|---|
| Internet | 7 |
| Television | 17 |
| Telephone | 38 |
| Electricity | 46 |

The total number of Internet hosts (a discussion of this measure follows in the next Section), has been increasing at a rapid rate during the past five years (see Figure 2-1). Worldwide, this number has grown from 5.8 million hosts in 1995 to 93 million hosts in July 2000 with the pace accelerating since January 1998 (Source: Internet Software Consortium).

**Table 2-2: Total PC Based Internet Users Worldwide**

| Year | Millions | Source |
|---|---|---|
| 1999 | 280 | Computer Industry Almanac, October 2000 |
| 2000 | 378 | NUA Surveys, September 2000 |
| 2002 | 601 | Computer Industry Almanac, October 2000 |
| 2005 | 765 | Computer Industry Almanac, November 1999 |

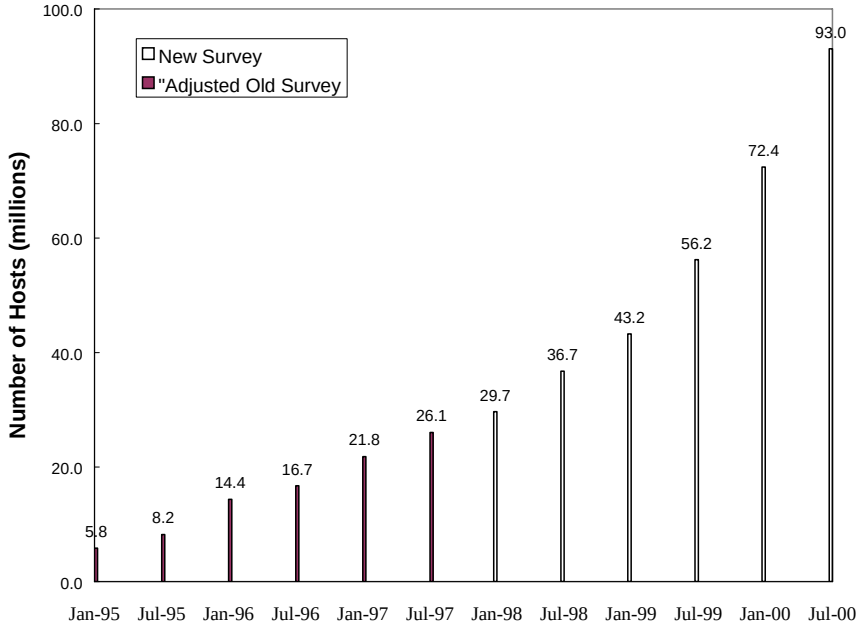
Table 2-2 shows the trend growth in Internet *users* another measure used to measure the size of Internet (will be discussed in detail in the next Section). The projected increase does not include users of none-PC based Internet access devices such as wireless phones, and hence gives a conservative estimate of the total number of Internet users. The number of users is expected to double over the next five years.

The question this paper poses is: Is this growth being enjoyed by every country and everyone equitably? Or are there structural barriers preventing countries from enjoying the fruits of this growth?

To this end, we view the world as comprising of three groups – the first group is comprised of those countries who are dominant players in the ICT revolution. They are the greatest beneficiaries at present. The second group is constituted by countries that have the potential to benefit from ICT, yet lag behind group one. These countries are making efforts that could pave the way for bridging the digital gap and benefiting from ICT in the foreseeable future. The third group is comprised of countries that are showing inadequate capacity to benefit from ICTs and are in danger of being left behind in the broad and sweeping changes that are taking place in ICTs. In fact, for this group ICT may play into a perversely circular dynamic by accentuating the structural inequalities that crippled their ability to participate in the ICT revolution in the first place.

**Figure 2-1: Global Growth of Internet Hosts**

**(Source: Internet Software Consortium)**



## 3. Barriers to Access

There are many factors that come between the potential user and the Internet to prevent him/her from benefiting from it. First, is *connectivity*, i.e., the availability and reliability of the infrastructure to access the Internet; Second is the *cost* involved in accessing the Internet on a regular basis, i.e., affordability; Third is the substance and language of the *content*, i.e., relevance, comprehensibility, etc.; Fourth is the *digital capability* of the society- at the individual and collective level, particularly the economic sector and the public sector, i.e., e-readiness; and finally, cash -- the availability, or lack thereof of resources to invest in information infrastructure, and research and development.

### 3.1. Connectivity

The task of measuring connectivity of a country is a demanding one. It involves determining the size of the Internet in every country in order to compare different countries. There are direct Measures and indirect Measures to assess the size of the Internet.

#### *3.1.1. Direct Measures of Internet Size*

The most common measures of Internet diffusion are:

- Number of Hosts
- Number of Users (Computer Industry Almanac, Nua Surveys)
- Number of Subscribers

A brief description of the metrics and a summary of the merits and limitations of each of the metrics is presented in Box 3-1.

#### *3.1.2. Indirect Measures of Internet Size*

Some of the most common indirect measures of Internet diffusion are:

- Tele-density,
- PC-Density, and
- Mobile-density

Tele-density given as the number of telephones per 100 people is a necessary pre-requisite for dialup access to the Internet. Similarly PC-density, measured as number of PCs per 1000 people, is also a pre-requisite for dialup access. Obviously these numbers provide the upper limit for dialup Internet access. Mobile density, measured as the number of cellular phones per 100 people, provides the upper limit for Internet access through wireless technologies. A more realistic upper limit can be obtained from the penetration rates of Internet-ready mobile phones.

#### *3.1.3. Inter-Country Disparities in Connectivity*

More and more countries are getting online. For instance, at the beginning of 1997 there were only 11 countries in Africa that had Internet access whereas by September of this

year all 54 countries and territories have permanent connectivity (Jensen 2000a). Yet the growth is not evenly distributed.

Tables A-1 and A-2 list the15 countries with the highest number of users and the fastest rate of penetration (per thousand population). These fifteen countries (with about 25% of the world population) account for 78% of the world's Internet users at the end of year 1999. Canada, the country with the highest Internet penetration rate, has nearly 9 times the average penetration rate of the world average and 356 times the average penetration rate of the African continent (African data from Jensen 2000a). The average host density in the OECD countries is 276 times that of the corresponding value in Sub-Saharan Africa (World Bank 2000b).

Disparities also exist in terms of the ICT base available for future growth. For instance, PC density of the "US is more than twice that of Japan, Germany, U.K. and France and more than 70 times that of China;..almost three-fourths of the school-based PCs are found in ten countries" (WITSA 2000). In the presence of such disparities, will the existing growth trends reduce and eventually eliminate the disparities?

Consider the three indirect measures: Mobile density, Tele-density and PC density. For purposes of comparison, let us choose two countries from the high-income group (U.S. and U.K.) and two from the middle income group (Argentina and Brazil) and two from the low-income groups (Bangladesh and Uganda). Table 3-1 lists their 1998 and 1999 values as well as their growth rate. We take the disparity as the difference between the respective "densities" in each country – for instance, the disparity in PC density between the US and Uganda in 1998 is given by 45.58 – 0.19 = 45.39 (In the US there will be 45.39 more owning a PC for every 100 people compared to Uganda). The corresponding disparity for 1999 is obtained similarly as 50.79 per 100 people. Clearly, the disparity has increased during this period, even though PC density grew more in Uganda (34% growth) compared to the US (12% growth).

The situation is not unique for the gap between the top tier and the bottom tier countries. If we compare the US and Argentina, an example of the gap between the top-tier and the middle tier, the gap increased from 41.13 per 100 in 1998 to 46.13 in 1999 even though Argentina 's PC density grew at a higher rate (19%) than the US (12%). The same is observed for the other two metrics, mobile density and Tele density. The disparities in mobile density between the US and Uganda grew from 25.29 to 30.89 per 100 during this 1 year period and the corresponding disparity between the US and Argentina grew slightly from 18.44 to 19.03 per 100. This growth in disparity occurred despite growth rates for mobile density for US (at 22%) being significantly lower than that of Argentina (73%) and Uganda (83%).

The moral of the story is that percentages are very deceptive and disparities have to be examined in terms of *base values* and in the changes in base values that the growth rates bring about.

It should be noted however, that if the mobile density of the US and Argentina continue to grow at the current rates, it can be shown that the disparities will decline slightly in the next one year period. However, the mobile divide between the US and Uganda will continue to expand. This outcome is tied to the relatively large mobile penetration level in the US compared to Uganda (the US penetration is 176 times that of Ugandan penetration) and the relatively smaller gap between the US and Argentina (the US penetration is about 3.6 times that of Argentina) at the beginning of the time period.

Mobile phones as an alternative Internet access device, promises to narrow disparities in access between high income and middle income countries, while they are unlikely to bridge the connectivity divide between high income countries and low income countries in the near future.

**Table 3-1: Indirect Measures of Internet Access – A Comparison**
Source: ITU (2000)

| Country | Mobile Density | | | Telephone Lines Density | | | PC Density | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | Growth | 1998 | 1999 | Growth | 1998 | 1999 | Growth |
| United States | 25.44 | 31.15 | 22% | 66.10 | 68.18 | 3% | 45.58 | 51.05 | 12% |
| United Kingdom | 25.24 | 46.28 | 83% | 55.69 | 57.45 | 3% | 26.97 | 30.64 | 14% |
| Argentina | 7.00 | 12.12 | 73% | 19.74 | 20.11 | 2% | 4.15 | 4.92 | 19% |
| Brazil | 4.68 | 8.95 | 91% | 12.05 | 14.87 | 23% | 3.01 | 3.63 | 20% |
| Bangladesh | 0.06 | 0.12 | 95% | 0.30 | 0.34 | 13% | 0.10 | 0.10 | 6% |
| Uganda | 0.15 | 0.27 | 83% | 0.28 | 0.27 | -2% | 0.19 | 0.26 | 34% |

Note: All densities are per 100 people.

### 3.1.4. Quality of Service

Thus far we have focussed on the quantitative dimension of connectivity. Quality of Service could also be a barrier under extreme conditions. International Telecommunication Union has documented quality of service data for 42 countries (ITU 2000). This Section focuses on the following two independent metrics of quality.

*Percentage of unsuccessful local calls*: Of the 42 countries in the ITU database, 15 countries had over 50% unsuccessful local calls during one or more of the last 5 years. All 15 are developing countries. The one with the worst record being Kenya which had over 76% unsuccessful calls last year.

Another indicator of the quality of service provided is the *number of telephone line faults* per 100 main lines per year. According to ITU (2000) at least 20 countries had over 100

incidents of faulty lines last year (i.e., on an average telephone line will need repairs twice a week).

From the above discussion, it is clear that developing countries not only have low levels of access but also poor quality connections when they access through dialup modems.

### 3.1.5. Opportunities for Collective Access

As subsequent discussions will show, cost of Internet access may be prohibitive for many low-income households if access depends on private and individualized ownership of Internet devices, a phone line (if necessary) and subscription to Internet. The response of some low-income communities in the rich countries is to seek public access points which provide less costly, or even free access as in the case of public libraries. For instance, nearly 8% of users in the US access Internet from public libraries.

For those who cannot afford private access, institutions to provide public access may well be the alternative. Tele centers and cyber cafes are two such institutions that are beginning to catch the imagination of users around the world. In South Korea for example, 43% of Internet users logon from cyber-cafes (Source: Net Value, http://www.nua.ie/surveys/?f=VS&art_id=90536059&rel=true). Absence of such institutions may well constitute a barrier to access Internet for many low-income families and individuals.

Data on the density of cyber cafes by country was compiled by the author from Netcafe.com that lists the registered cyber cafes around the world. The data in Table 3-2 are for the African continent and represent the lower bound of the number of cyber cafes in any country at the time of compilation. These numbers are lower bound estimates because of the possibility of unregistered cyber cafes. It should be noted that cyber cafes documented in this Table are essentially located in either the capital city or in a key secondary city in the country.

Of the 167 cyber cafes identified in Africa, four countries (Egypt, Morocco, South Africa and Zimbabwe - together constitute 18% of the African population) accounted for nearly 59% of the total number of cyber cafes. The density of cyber cafes (per 1 million population) range from 0.06 in Algeria to 4.44 in Namibia (or to 5.00 in Cape Verde).

Hourly cost of using Cyber cafes (wherever available) ranged from US $0.90 to US $7.50 in Botswana. Obviously, at these rates cyber cafes are not targeting low-income households in Botswana. Nevertheless, cyber cafes as an institution could offer possibilities for allowing a larger segment of the population to access the Internet.

**Table 3-2: PREVALENCE OF CYBER CAFEs IN AFRICA**

| | Cyber Café | Cost/hr | Cyber Café/million population |
|---|---|---|---|
| Algeria | 2 | | 0.06 |
| Benin | 1 | | 0.16 |
| Botswana | 1 | $7.50 | 0.63 |
| Cape Verde | 2 | $4.00 | 5.00 |
| Egypt | 21 | $6.00 | 0.30 |
| Ethiopia | 1 | | 0.02 |
| Gambia | 2 | $2.4 - $4.8 | 1.43 |
| Ghana | 3 | $0.90 | 0.15 |
| Kenya | 7 | $3-$5.6 | 0.23 |
| Lesotho | 1 | | 0.48 |
| Libya | 4 | | 0.78 |
| Madagascar | 2 | | 0.13 |
| Malawi | 3 | | 0.29 |
| Mali | 1 | | 0.09 |
| Mauritius | 4 | | 3.33 |
| Morocco | 19 | | 0.63 |
| Mozambique | 1 | | 0.05 |
| Namibia | 8 | | 4.44 |
| Nigeria | 3 | | 0.02 |
| Rép du Cameroun | 1 | | 0.06 |
| Sénégal | 2 | | 0.20 |
| South Africa | 44 | | 1.01 |
| Sudan | 1 | | 0.03 |
| Swaziland | 1 | | 0.91 |
| Tanzania | 9 | | 0.25 |
| Togo | 3 | | 0.60 |
| Tunisia | 2 | | 0.21 |
| Uganda | 2 | | 0.09 |
| Zambia | 2 | | 0.21 |
| Zimbabwe | 14 | | 1.24 |
| | 167 | | |

Updated, link checked: 24.10.00 - 167 cafés
Source: Sited in NetWizards, by Netcafe.com
Population Source: July 2000 Estimates by CIA

**Box 3-1: Measures of Internet Size**

The size of the Internet has been measured by estimating the number of hosts, the number of users or the number of subscribers. However, as we discuss below all these measures have some shortcomings.

Number of Hosts

This metric is widely used to represent the size of the Internet. Network Wizards, a company that conducts surveys of Internet Hosts offers the following definition: *"A domain name that has an Internet Protocol (IP) address (A) record associated with it. This would be any computer system connected to the Internet (via full or part time, direct or dial-up connections)*". Domain names (such as www.undp.org ) comprise of top level domain names (TLDs) (in this example it will be .org) which can be generic TLDs or country specific country code TLDs (ccTLDs). For instance, .com, .org, .net, .edu are gTLDs which are not specific to any geographic location. On the other hand, ccTLDs are TLDs associated with specific countries. For instance, domain names with the two-letter ISO country code .uk or .sl are associated with the countries United Kingdom and Sri Lanka, respectively.

In determining the distribution of hosts by country, we need to estimate the distribution of gTLDs country by country and then add that number to the tally of ccTLDs by country.

An important limitation with getting accurate statistics of the geographic distribution of ccTLD is that we cannot intuit the home country of the host from the domain name. For instance, a domain name with .nu may be assumed to be located in Niue. In reality, there is no reason to make such assumption since a host could be registered in Niue but can be located anywhere in the world. Indeed as Network Wizards point out that "there is no way to determine where a host is without asking its administrator" (http:/www.isc.org/ds/faq.html)

In addition, there is the even more compound problem of determining where gTLDs are located. A .com domain name could be located in any country. This poses a challenge to estimating the geographic distribution of internet hosts, since gTLDs constitute the majority of the registered domain names -- As of January 2000, gTLDs accounted for nearly 75% of the of total Internet hosts (Zook, 2000).

Number of Users

This seems to be a natural choice for a measure of Internet penetration. However, comparisons of data between different surveys may pose a problem as there is no standard definition of the user! Frequency of use of Internet and the age of the user population may vary from survey to survey. For instance, one survey could treat user as one who used the Internet at least once in the last six months while another survey could define user as who uses Internet at least once a month. Some surveys may include anyone above the age of 2 as their population and some include only those above 16 years (see Table 2 of Minges 2000 for rich details).

Number of Subscribers

This measure is sometimes used to determine the size of Internet. Subscribers are those who pay for Internet access on a regular basis. The number of subscribers is not only a measure for the number of users but is also suggestive of the frequency of use. However, there is no reliable method to estimate the number of users from the number of subscribers as the ratio of users to subscribers will vary. Moreover, in competitive ISP markets, it becomes difficult to access this data to estimate countrywide subscribers as many ISPs may not be registered.

These limitations are pointed out not to cripple the idea of measuring Internet size *per se* but to alert the reader to the difficulties in comparing information derived from different surveys.

### 3.2. Cost of Access

Cost of access to the Internet constitutes the following:

- Cost of computer amortized over its life span.
- Telephone Tariff and Line Rental: Telephone Tariffs are the charges for local calls (in some countries this could be the long distance call), whereas Internet connection and line rental constitute the fixed monthly cost of renting telephone lines.
- Cost of Internet Service Provider (ISP).

There is considerable variability in the cost of Internet access across countries (Table 3-3, Table 9 of ITU 1999, pA-29, Fig 1.1 of ITU 1999, p.14). Among industrialized countries, the annual access cost in 1998 (excluding the cost of computers) varied from US $300 in Singapore to US $1125 in Luxemburg; in Africa, the annual access cost (excluding the cost of computer) varies from US $150 in Botswana to US $1375 in Madagascar (Jensen 2000a). More importantly, in number of most countries of the South users pay a much higher fraction of their per capita GDP on access fees. For instance, a typical US user will pay 1.2% of the per capita GDP every month to access the Internet while a user in Madagascar will pay 614% of the per capita GDP on monthly access charges. In this section we examine factors that lead to such vast disparity in access costs.

#### *3.2.1. Cost of Computer: Trends in the Cost of PCs*

The initial layout cost of a PC constitutes a significant component of the overall access cost. It was estimated that the average cost of a Pentium level PC in 1998 for OECD countries amortized over fours years accounted for 31% of the connection charges. Thus the amortized cost of computer (assuming typical life span) should be included in estimating access costs.

Current data on the cost of computers in different countries are difficult to document in liberalized market economies, and consequently, the OECD has stopped collecting this information since 1998. However, we do know that the cost of PCs has continued to register dramatic declines over the past decade. Consider the US, one of the key manufactures of computer hardware. According to the US Bureau of Labor Statistics, the producer price indices for PCs/Workstations showed a 72% decline between 1993 and 1999 (see Figure 3-1). In the US, Pentium level computer costs under $1,000, typically between $600 and $800. Differences in the retail value of computers across countries have also diminished in the current trade regimes. Import tariff and prevalence of national distribution channels being the significant variables that affect the variation in the local cost of computers.

**Figure 3-1: Producer Price Indices for PCs in U.S., 1994-1999**
**Index: December 1993 = 100**

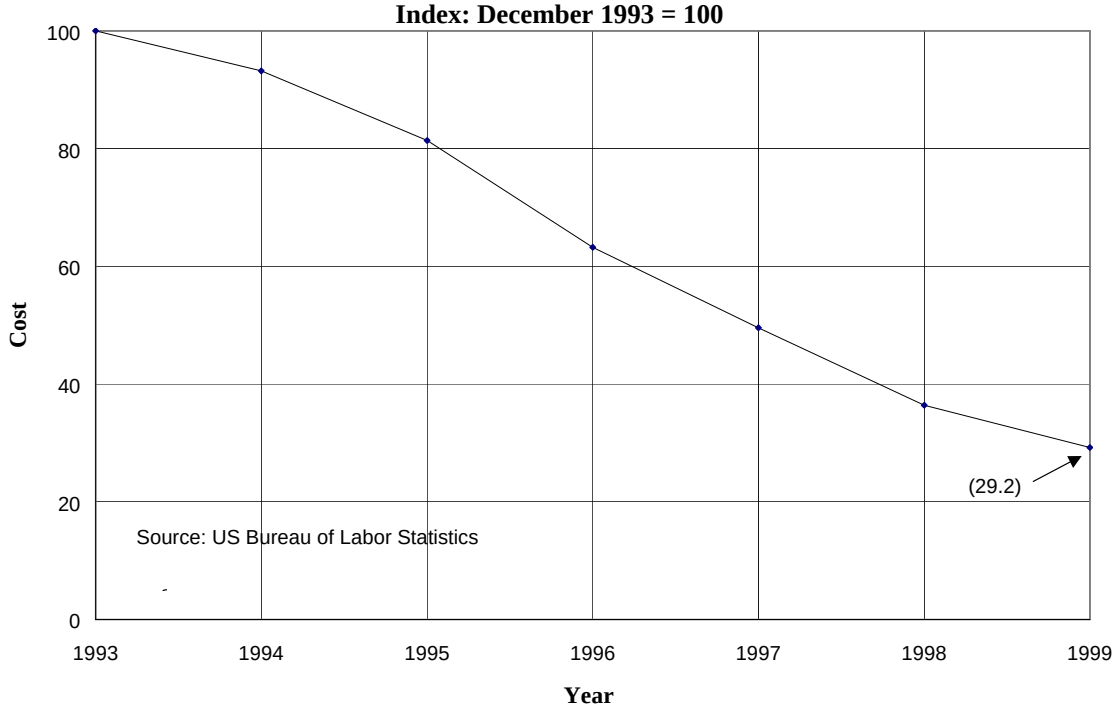


**Table 3-3: Affordability of Internet Access in Selected African Countries**

| Country | Annual Internet Access Cost | Cost/GDP per capita | No. of Subscribers |
|---|---|---|---|
| Madagascar | $1,375 | 613.8% | 2,000 |
| Kenya | $1,650 | 475.5% | 30,000 |
| Mozambique | $380 | 441.9% | 6,000 |
| Ethiopia | $400 | 388.3% | 2,500 |
| Burundi | $600 | 377.4% | 150 |
| Benin | $1,250 | 334.2% | 4,000 |
| Cameroon | $975 | 158.0% | 2,500 |
| Burkino Faso | $300 | 150.8% | 3,000 |
| Guinea | $770 | 113.7% | 300 |
| Angola | $1,740 | 103.3% | 4,000 |
| Djibouti | $600 | 70.9% | 250 |
| Algeria | $900 | 62.4% | 2,000 |
| Senegal | $300 | 57.9% | 4,000 |
| Morocco | $600 | 49.3% | 75,000 |
| Mauritius | $575 | 15.7% | 13,000 |
| Nambia | $250 | 12.2% | 3,000 |
| Gabon | $450 | 8.8% | 1,500 |
| Bostswana | $150 | 4.6% | 15,000 |

Source: Adopted from Mike Jensen, "African Country Internet Summary Status Report, September 2000; http://www3.sn.apc.org/africa/afrmain.htm

*Affordability of PCs*

While the absolute cost of computers may continue to fall across countries, it is a poor indicator of the *affordability* of PCs. The purchasing power of users is critically important and one measure of affordability is provided by examining the PC price as a percentage of per capita GDP. The ITU estimated that in 1998, the price of a PC was 5% of the per capita GDP of higher income countries (i.e., countries with an income level above US$25, 870). The corresponding price was 289% of per capita GDP for the lower middle income countries (income level US$1,740). Thus individualized computer access will be beyond the reach of the vast majority of the developing world while such access continues to become increasingly affordable to those in the North.

### *3.2.2. Cost of Local Telephone Calls*

There is an accelerated trend to substitute dial-up technology with alternative technologies (see Table 3-4) in accessing the internet. However, as of 1998, as many as 90.8% of households worldwide used dial-up modems to connect to the internet. Dial-up access to the internet involves placing a call to the ISP for the duration of Internet connection. Thus access to the internet through this technology, requires having permanent access to telephone. The cost of dial-up access involves tariff on the local call and line rental – these together constitute 45% of the average internet access cost in OECD countries (ITU 1999).

There are many different models for pricing local calls placed on Public Switched Telephone Network (PSTN). The common method in North America is a flat-rate system in which the user pays a flat fee independent of the volume of use. Another method practiced, for instance in Australia, is unmetered calls in which the duration of the call is not accounted for and pricing reflects the volume of calls. The most common practice in developing countries as well as most european countries is to price the call depending on usage – where usage is defined in terms of number of calls, duration of call, time of day/week call is placed and distance called. In some instances, the ISP absorbs some or all of the cost of local calls.

Telephone charges could become a significant component of Internet Access. ITU 1999 disaggregates access cost in 1998 in terms of ISP cost, call charge and line rental charge for 45 countries. The call charge reflects 20 hours of off-peak connection per month. It can be seen that in 12 of the 45 countries (including many European countries such as France, Luxemburg, Denmark etc.) local call charges exceeded the ISP charges.

The telephone charges are compounded for users outside the major cities in many low-income countries. For these users the call to the ISP may well involve expensive long distance charges with calls into the metropole rather than merely local charges. Of the 54 countries and territories in Africa, only fifteen have local dial-up access nationwide (Jenson, 2000). For instance, in Cameroon dial-up services at local rates are available only in Yaounde and Douala (ITU 99). To address this problem, 15 out of the 53 countries in Africa have national telecommunication initiatives that regulate prices by having local tariff rates capp internet access charges from anywhere within the country (Jenson 2000).

Alternative technologies such as broad band access obviate the need to place telephone calls. For residential users broad band access is usually provided through digital subscriber lines (DSL) or cable. Currently broad band technology is used by around 1% of residential users but this share is expected to grow to 12.1% in 2003 (see Table 3-4). However, even in developed countries broadband access costs at least twice as much as the regular dial-up access.

**Table 3-4: Global Share of Access Technologies**
Source: OECD, 2000

| | Transmission Speed[1] | | World Wide Market Share in % House holds | | Platform |
|---|---|---|---|---|---|
| | Down Stream | Upstream | 1998 | 2002 | |
| Dial-up Modem | Up to 56 Kbps | Up to 56 Kbps | 90.8 | 66.8 | Normal Phone Lines |
| ISDN | 56-128 Kbps | 56-128 Kbps | 8.0 | 20.4 | Supplied by PTT |
| DSL | 1.5 – 9 Mbps | 16- 500 Kbps[2] | 0.1 | 4.4 | Normal Phone Lines |
| Cable Modem | 0.5-30 Mbps | 0.1-1.0 Mbps | 0.9 | 7.7 | CATV networks |
| Wireless[3] | 9.6 Kbps | 9.6 Kbps | 0.2 | 0.6 | Wireless Path |
| Satellite | 0.4 Mbps | 0.1 Mbps | | | Wireless Path |

*Trends in the Cost of Local Calls and Line Rentals*

The International Telecommunications Union conducted a study on the cost of local calls, monthly residential line rentals and international calls for 39 major economies for the period 1990 – 1997 (ITU 1999; p 32). For the purposes of this survey local calls were taken to be of 3-minute duration placed during peak rate time. The costs evidence a trend increase of an approximate magnitude of 19% over this period (it is interesting note that during this period the cost of international calls registered a decline of approximately 38%).

In OECD, the average cost of accessing Internet (20 hours/month at peak time) declined by 24 percent in the one year period between October 1999 and September 2000 (OECD, 2000). Moreover, emerging trend toward unmetered telecommunication prices for internet access contributes to the downward trend of total cost. As of September 2000, Australia, Mexico, New Zealand and US offer unmetered access.

[1] Downstream refers to data transmission towards the user, upstream refers to transmission back to the service provider
[2] Forecast
[3] Market share includes satellite.

### *3.2.3. Cost of ISPs*

A close study of the cost of ISPs across countries reveal that for users in many low-income countries, particularly in Africa, ISP charges are *unaffordable* to the vast majority of the population. Moreover, many of these users are often paying more for their ISPs than their counterparts in high-income countries.

Even a relatively modest charge of $12/month access cost is staggeringly unaffordable for the vast majority in many low-income countries. In fact it is comparable to the GDP per capita of at least 8 countries in Africa. As shown in Table 3-3, ten of the eighteen countries studied in Africa showed annual Internet access cost greater than their respective GDP per capita. The most extreme case is Madagascar, with internet access costing more than six times the GDP per capita – it has only 2000 (approximately) internet subscribers out of a population of 16.37 million.

In the case of high-income countries access is relatively more affordable – particularly, with unmetered access for both the internet and local telephone calls. For instance, the total cost of access (including ISP, local calls and line rental) in developed countries range from 1.2% to 2.5% of the GDP per capita (OECD 2000).

The affordability problem in countries of the South is, of course, conditioned by general and overarching conditions of poverty. In addition, however, it is striking that internet users in many of these countries, are paying higher ISP costs than their counterparts in the North. It is evident that there is wide variation in the ISP charges even among high-income countries. According to ITU 1999, the cost of ISPs varies from $9.49 in Finland to $41.39 in Japan (based on 1998 estimates for 20 hours of Internet access). It is equally evident that the average ISP charges reported in developing countries like India (US $12.77) and China (US $39.26) lie within the range of ISP charges of high-income countries. Yet, there are number of low-income countries where internet access charges are higher than the access charges in high-income countries. For instance, in 1998 the average Internet access cost in Africa was estimated to be $58/month (Jenson 2000 b). Relatedly, at least 13 countries in Africa have monthly access costs over US $41.39/month (Jenson 2000 b).

For the most part we do not see extensive intra-country variation in access charges within the North. In contrast however, in low-income countries, access charges may vary by an order of magnitude (from US $10 to US $100/month) within countries (Jenson 2000 b). Nationwide service may not be available in most instances and when available the quality and the cost of service vary considerably. The primary factors contributing to the variation are the costs incurred by the ISPs in accessing international network, the distance from POP and hours of access.

### 3.2.3.1. Reasons for High Cost of ISPs in Low-Income Countries

*Retail Pricing and Economies of Scale*: It is apparent that most low-income countries have an extremely small user base. Bracketing aside South Africa and Egypt, consider the situation in the rest of Africa. The total number of Internet subscribers in the other 51 countries is around 362,900; at least 23 of these countries have less than 1000 subscribers (Jenson, 2000 a). This small user base does not lend itself to economies of scale and scope. As a result, ISPs set high prices to ensure profits from a small client base consisting of elites and wealthier NGOs. For instance, an account with Africa Online in Ghana costs around US $50 per month which is more than double the cost of AOL ($22) in the US (ITU 1999).

**Box 3-2: Retail Pricing Models for Internet Access**

Retail pricing models affect the access cost to the user and hence, on Internet penetration in the developed countries. There are two prevalent models namely, *Metered pricing* schemes, and *unmetered* pricing schemes. Metered pricing follows the PSTN example and is widely prevalent in Europe. Such schemes link access cost to the volume as well as time of Internet use and hence, tend to impose a cost on the efforts of the users to familiarize with the technology. Unmetered pricing borrows the idea from sectors in the entertainment industries such as Cable TV. It was first introduced to Internet access in 1996 by AOL and quickly became an industry standard in the US. Unmetered pricing structure is conducive to the extensive exploration and experimenting which users require to become familiarized with the new technology and is best suited to build a client base of habitual users. Countries such as Australia and New Zealand also have unmetered access, and there is an increasing trend in Europe to move towards this pricing model.

*Wholesale Pricing of Internet Access*

Economies of scale, however, is only a partial explanation. The ISPs in low-income countries incur higher costs than their counterparts in high-income countries – costs which they pass to their customers. The most significant cost for ISPs is the cost of connecting to an international backbone. The International Telecommunications Union (1999) identifies the following three reasons for these costly international connections:

i) ISPs pay above cost prices to route their traffic through the international gateway of the incumbent telephone company; in many cases of low-income countries, the incumbent telephone company is a national monopoly which levies above-market tariff on ISPs seeking to access the international gateway.
ii) Developing country ISPs usually bear the full cost of connection (both half-circuits) to backbones in other countries, invariably US.
iii) Developing country ISPs wishing to connect with the Internet backbone in another country will normally be required to make a payment for peering and transit of traffic. This price system continues even though, once established, the connection can be used by all Internet users, not just the ISP's customers. Thus subsidized by developing countries, US ISPs and customers are obtaining free and growing connectivity to overseas sites.

Why do we need to make expensive connections to the International backbones? Given minimal to non-existent intra-regional connectivity, there are overwhelming economic incentives (and perhaps sheer technical necessity) for ISPs to connect through international backbones, often it means transiting through the US. For instance, the Asia-Pacific region to US bandwidth is 1.6 Gbits/s while within all Asia-Pacific it is 0.1 Gbits/s (ITU, 1999). Similarly, given the scarcity of locally generated content, users are forced to turn to international sites. As a result users seek out expensive international connections. The U.S. of course, harbors much of the information content and technical infrastructure and draws in much of the traffic.

**Box 3-3: Wholesale Pricing- International Dimension : PSTN Vs Internet**

Public Switched Telephone Network (PSTN) uses *Settlement system* based on a *Half Circuit Regime* for wholesale pricing of international connections. In PSTN, there is a dual-price system in which each call is associated with a charge to the caller who originates the call (known as the *collection charge*), and to the Public Telephone Operator (PTO) who originates the call (at a lesser rate known as the *accounting rate*). Both prices depend on the duration of the call. But most importantly, if there is an asymmetry of traffic (i.e., traffic is flowing mostly in one direction) then the balance of traffic is charged at the *settlement rate* (usually at half the accounting rate), i,e., the PTO in the country at either end of the link is responsible for providing and paying for a half-circuit. The basic assumption informing this pricing model is that parties at either end of the link benefit equally from a call.

What does this mean for developing countries? Generally, developed countries generate more international calls to developing countries than they receive. The resulting asymmetry translates in to income (equal to the difference in traffic in each direction charged at half the accounting rate) for developing countries. In fact, between 1993 and 1998 settlement system resulted in a transfer of 40 billion US dollars to developing world from developed world (ITU 1999).

Wholesale pricing on the Internet however is quite different. Charges here are based not on the duration of the use but rather on the *total volume* of traffic. Arrangements known as the "*peering and transit*" agreements between operators determine the cost of using Internet backbone. Peering arrangements determine the cost to the ISPs to establish a point of presence (POP) in backbones (or the cost for smaller backbone networks to interconnect with bigger ones).

As pointed out in ITU (1999), because of the peering and transit agreements, "..developing country operators end up paying twice – first for the circuit, then for the traffic – even though traffic flows in both directions once circuit is established". Since most of the back bones are owned by the developed countries (US alone has 41 backbones, ibid), cash flows from developing countries to developed countries.

The rationale for peering and transit model is the following: About 75% of the traffic is related to Web browsing (National Laboratory for Applied network research, US http://www.nlanr.net/NA/tutorial.html#q10). For such applications, upstream traffic (from user to server) involves a few keyboard strokes (and/or clicks) while downstream traffic will be much heavier as it will involve data flow (in Internet networks the ratio of asymmetry could be as high as 20:1). User is the sole beneficiary of the traffic in both directions, while content providers gain nothing. Therefore, user should be responsible for the whole circuit and traffic.

Is user the sole beneficiary of the content flow? This situation is changing with the widespread prevalence of advertising and of course, e-commerce. It is estimated that by year 2004 total world wide online advertisement expenditure to reach US $33 billion with estimated US share around 70% (ITU 99, p56.). By allowing ads in their sites and tying the revenues from ads to the reach of their web-sites, content providers gain monetarily by having users access their sites. Hence value flow is no longer one-sided. In addition, growing e-commerce may benefit sellers located in the North by allowing them to reach the market in the South. Yet peering and transit costs continue to prevail.. By which the users in developing countries are subsidizing the advertising efforts of the producers in the developed world by paying for the circuits and the traffic!

Who benefits from peering and transit arrangements? Internet was developed in the US first and it had, thanks to extensive public investment, most of the early backbones. When other countries began to use the Internet, there was well-established backbone infrastructure in the US and well designed popular web-sites. Presence of connectivity and content resulted in 90% of the world's Internet traffic in 1999 touching the US. The prime beneficiaries are of course, the US companies that own over 40 of the main backbones.

At present almost all regions rely on US for connectivity. This is unlikely to change unless there is substantial intra-regional and inter-regional traffic. And that is possible if substantial increase in local web-sites providing content for the locals. There are few incentives for the US companies to establish backbone networks in other countries when others are willing to pay for the infrastructure to be developed within US. The simplest way of reducing a significant part of the connection cost is to own international backbone with transatlantic connectivity.

### 3.3. Content

Information is one of the key factors that motivate people to use Internet. Therefore, absence of relevant content may act as a barrier to Internet access. The task of providing demand driven information to all users and would be users is a challenging one. Determining the aggregated needs of individuals and locating where available Internet content fails or succeeds to meet these needs is beyond the scope of this work. However, it is possible to verify a less stringent requirement. Namely, *availability of web content in the language of the user*. To this end we need two sets of data. First, the distribution of Web users by their native language, and second, the distribution of unique web pages by their content language.

A similar approach was adopted in ITU (1999) where the distribution of online linguistic populations was taken from 1998 values determined by EuroMarketing, and the distribution of web pages by language of content was obtained from a study conducted by Internet Society and Alis Technologies. This study was conducted in 1997 using a sample size of 3239 web pages. Since then the data has not been updated, particularly on the distribution of web languages.

Evidently the data needs to be updated. The online population of about 117 million at the end of 1998 more than doubled by the end of 1999 to 245 million (Global Reach, http://www.glreach.com/globstats/evol.html). Moreover, as reported in State of the Internet 2000, the number of unique, indexable Web pages doubled from one billion in January 2000 (source: study by Inktomi and NEC Research Institute) to two billion six months later in June 2000 (source: Cyveillance). In light of these very high growth numbers it becomes necessary to look at more current data.

#### *3.3.1. Data & Methodology*

The distribution of Internet users by their language is compiled by Global Reach (http://www.glreach.com/globstats/index.php3). Estimates of a particular linguistic population online may involve more than one country – for instance, English speaking populations will involve parts of the US, Canada, United Kingdom, South Africa, New Zealand, Australia, and non-native-English speaking countries such as India, Pakistan and the Phillipines. Information is available for 28 linguistic communities, of which 21 are European and the remaining seven are Asian. Of these, only 22 had corresponding data for the number of web pages and were chosen for our analysis (the excluded groups are Slovak, Slovenian, Turkish, Arabic, Thai and Malay). The online distribution of the users by language is presented in Figure 3-2.

The data on number of users is collected from different sources for different linguistic communities and are documented in http://www.glreach.com/globstats/refs.php3.– the sources include an assortment of official sources (e.g. Australian Bureau of Statistics), semi-official sources (e.g. ITU), newspapers, journals (e.g. Budapest Business Journal) and private companies involved in market research (e.g. AC Nielsen, etc.). However, in

three instances, the fraction of the total online population was *estimated* by Global Reach (namely, German, Greek and Polish populations) – for instance, of the 22.4 million German speaking online population, 750,000 were *estimated* by Global Reach to be Germans accessing Internet from the United States. Also, as observed in Section 1, the definitions of a Internet user varies from source to source and hence numbers may not be comparable across sources. It is also not clear if indeed the sources had differences in the definitions of users and if so what techniques were used to render the compiled data for different communities consistent and comparable.

The distribution of web pages by language was compiled by the author using Alta Vista search engine. This search engine can search for documents available in one or more of the 25 languages. Using a wild card search (* ) yields the number of all html documents that can be searched by Alta Vista in a selected language. As of November 13, 2000, altogether 239.75 million web pages were identified in the 25 languages (compared to the 3289 web pages analyzed in the last available study of Internet Society and Alis Technologies in 1997), which is approximately 11.9% of the Web content. For the purposes of this analysis, 22 languages were considered and web pages for estonian, lithuanian and latvian languages (totaling 626,312 web pages) were ignored as corresponding data on the number of users were not available. The results are presented in Figure 3-3.

Two limitations of the above data should be recognized. First, the search engine has failed to identify 87.1% of web pages (taking the estimate of 2 billion web pages to be an accurate one), the distribution of the missed pages need not be identical to the distribution of those pages located by the search engine. The second limitation is that the data set is primarily for European languages – of the 25 languages only four are non-european, namely, Hebrew, Japanese, Korean and Chinese.

### *3.3.2. Results & Analysis*

Figure 3-2 shows the distribution of online population by language and Figure 3-3 shows the distribution of web pages by language. It is apparent that English language speakers and content in English both dominate the web. The number of English speakers online is nearly 7 times that of the second largest online users -- the Chinese, and as of September 2000, is more than all other users put together.

The content seems to overwhelmingly favor the english speakers -- who have nearly 82% of the web content while being between 48.5% and 50.9% of the online population. The Chinese, Japanese and Koreans, who combined together constitute nearly a fifth of the online population (18.9%), have less than 0.5% of the web content.

Based on data collected since 1995, Global Reach has made projections of the evolution of the distribution of 11 linguistic online communities up to year 2005. The rate of growth of total population has been increasing since 1995 up to the year 2000. The online population went from 50 million to 394 million during this period. It is projected to grow albeit at a less rapid pace to 850 million by the year 2005.

The composition of online communities, however, is projected to undergo substantive changes. English speakers will no longer constitute the majority by the end of this year. Their share declined from 88.5% in 1996 to 50.9% in September 2000 and is expected to decline to 48.5% by the end of 2000 and to 28.4% by the end of 2005. The share of three Asian communities, Japanese, Korean and Chinese, quadrupled from 4.6% in 1996 to 18.9% in 2000 and is expected to grow to 33.8% by 2005. The Spanish speaking population has also registered significant growths – from 0.4% in 1996 to 5.6% in 2000, and expected to grow to 8% by the end of 2005.

The proportion of web content in the English language does not appear to have changed since 1997 when it was reported to be 81% (ITU 1999). This however, implies an increase in inequality since during this interval, the proportion of English speakers has declined from 70.9% (at the end of 1997) to 50.9% (as of September 2000). The divide between users and content available in their native language reflects the following: i) the inertia of the historical advantage English has enjoyed from the very inception of the Internet, (it should be noted that at the beginning Internet linked the English-speaking academic/research community); and ii) the relative difficulty in adding content to the Internet compared to adding a user.

Lack of relevant content can be addressed relatively inexpensively by building content in local languages as well as browsers and search engines in different languages. Such an effort is well underway in East Asia (e.g. Yahoo-China) and India. Another possibility, which could be an interim measure, is to build translation capabilities into the browsers. The translation capability exists now, however, technological development of translation is in its embryonic stage at best, and the available capabilities are rather minimal. For instance, Alta Vista provides translation from English to four other European languages (French, German, Spanish, Portugese). Translation is limited to text (text in graphs and pictures will not be translated) and the maximum size that can be translated at a time is limited to 5-10K.

While these measures seem to address some of the concerns of the relatively more powerful players, very little is under way to provide content in the local languages in many low-income countries. As pointed out earlier, without relevant content it is difficult to attract online users. However, without a significant user base it is difficult to generate the content through market forces. And many low-income countries are without an adequate user base -- for instance, 25 countries in Africa have less than 1000 subscribers (Jensen, 2000b).

**Figure 3-2: Distribution of Users by Language**

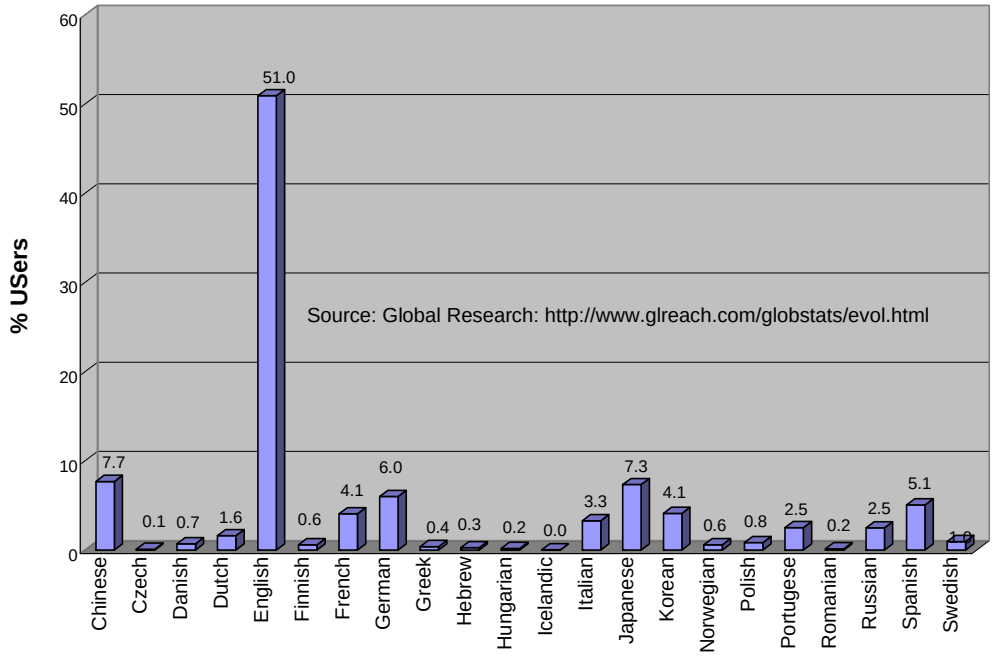
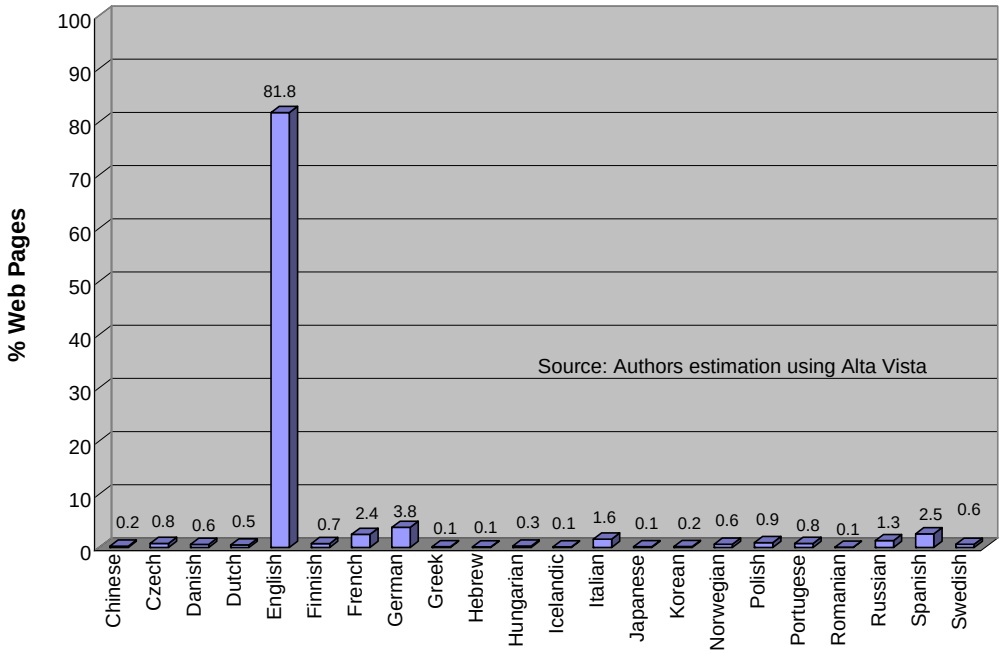



**Figure 3-3: Distribution of Web Pages by Language**



### 3.4. Capacity and E-Readiness

It should be recognized that E-readiness is not a static concept but depends on the available technology, particularly, how that technology interfaces with the user. For instance, an illiterate user will be considered as not ready for the Internet as we know it here; but providing interfaces that will allow such a user to interact with the client computer through a combination of audio commands and manipulation of symbols will eliminate her/his incapacity to use ICT. Real life examples are available in India which has cyber-cafés meant for illiterates.

The digital readiness of countries involves not only availability of reliable and affordable ICT infrastructure that we discussed in the previous sections, but also the following:

- Availability of human capital that is capable of using, innovating and adapting the new technologies.
- Capacity of different Sectors of the society to accept and absorb ICT in two key segments of society, namely,
    - e-government
    - e-commerce
- Organizational Infrastructure to legislate and implement appropriate legal frame work for the use of ICT in these Sectors.

In the following section we explore these dimensions in the global context.

#### 3.4.1. Availability of Human Capital

To use Internet in its present form, literacy is a basic prerequisite. Clearly, developed countries which have 99% adult literacy rates will have an advantage over the least developed countries where female adult literacy rates are as low as 38.1% (HDR 1999).

However, becoming a regular user of Internet takes more than literacy. To overcome the difficulties associated with learning a new technology and to become familiarized with computer based applications requires *digital* literacy. There are no direct ways of estimating the digital literacy of a country; however, proxy measures such as PC penetration, will give an indication as to the level of the digital literacy prevalent. PC penetration per 10,000 population ranges from 7 in Ethiopia to 5272 in Singapore (ITU, 2000).

In the context of developing countries, where PCs are unaffordable for most households, the number of computers in educational institutions per million population may be a more useful metric. According to WITSA (2000), a number of developing countries have shown dramatic growth in the PC base in Education during the period between 1992 and 1999. For instance, the total number of PCs in the educational institutions in India increased from 11,163 units to 101,368 units during this period. Yet, this also means that nearly 15% of world population has 0.4% of the worldwide installed base of PCs in the

Education Sector. In terms of PC density in Education institutions, as of 1999, India had 100.5 units per million people (compared with Japan which had 12,082 units per million population).

To adopt, innovate and fully optimize ones one's use of ICT as an instrument of social and economic growth, a country would need more than digital literacy – it would need a technical and scientific base. Table 3-5 summarizes the availability of Technicians and Scientists (per million population) in different regions (World Bank (2000); "Are Poor Countries Loosing the Information Revolution?"). Outside OECD countries, Eastern Europe and the Transition economies seem to have the most technical and scientific human capital (with 577.2 Technicians per million persons and 1841.3 scientists per million persons). The least well off is the South Asian region which has less than a tenth of the human capital of Eastern Europe and the transition economies – 59.5 technicians and 161 scientists per million persons.

**Table 3-5: Availability of Human Capital**

Source: InfoDev (http://www.infodev.org/library/working.html)

| | Technicians / Million People | Scientists/ million people |
|---|---|---|
| | | |
| OECD | 1326.1 | 2649.1 |
| Middle East | 177.8 | 521 |
| East Asia | 235.8 | 1026 |
| Latin America and Carribean | 205.4 | 656.6 |
| Eastern Europe and Transition Economies | 577.2 | 1841.3 |
| Sub-Saharan Africa | 76.1 | 324.3 |
| South Asia | 59.5 | 161 |

### 3.4.2. Capacity of Different Sectors

#### 3.4.2.1. E-Government

Potential benefits of ICT in governance are enormous. It can have a significant impact in shaping the institutions and communication networks of government's relation to the private sector and civil society. ICTs enable government bodies to work with greater transparency (from decision making processes to implementing policies to awarding contracts), accountability (by providing the citizenry with better access to information regarding their rights and benefits) and collective participation (by providing a direct communication channel between the government and citizens/residents of the nation).

Increasingly different state organs have gone online in many parts of the world.

Table A-3 summarizes for each country the total number of government organs that have gone online. The list includes, state bodies, political parties, judiciary, legislature, etc. Since basic functions of the government remains similar across countries, the total number of government online sites rather than a population adjusted measure becomes relevant.

As seen from the Table A-3, only Germany and England have over thousand online sites for government. France, India, Italy, Spain, Sweden, and United States have between 500 and 999 sites. With the exception of South Africa, all African countries have less than 50 government web sites.

### 3.4.2.2. E-commerce

Attempts have been made to provide an inter-country ranking of e-business readiness. McConnell International and WITSA (2000) evaluated 42 countries for their e-business readiness considering:

- connectivity ("are networks easy and affordable to access and to use?"),
- e-leadership ("Is e-readiness a national priority?"),
- Information Security ("Can the processing and the storage of networked information be trusted?"),
- human capital ("are the right people available to support e-business and to build knowledge-based society?"), and
- e-business climate ("how easy is it to do e-business today").

For each criterion they rated countries in terms three grades: ready, improvements needed, or substantial improvements needed to become e-ready. All six of the African and West Asian countries studied (Saudi Arabia, South Africa, Ghana, Kenya, Nigeria and Tanzania) were deemed to require substantial work to become e-business ready. Of the ten Asian countries studied (China, India, Indonesia, Malaysia, Pakistan, Phillipines, South Korea, Taiwan, Thailand, and Vietnam), all countries except for South Korea and Taiwan were said to require substantial improvement in connectivity. Five of the ten countries including Thailand, Vietnam, Indonesia, Pakistan and Philippines, were found to be not ready in four or more of the five aspects of e-readiness. Only Taiwan and South Korea were characterized as close to becoming e-business ready.

Of the eight countries studied in Latin America, Ecuador and Venezuela were said to need substantial improvements to become e-ready, while Argentina, Brazil Chile, Costa Rica and Mexico were said to show promise. In Europe, Ukraine, Russia, Romania and Bulgaria show the least e-readiness, with Greece, Hungary and Italy showing the most e-readiness of the countries studied.

Another study on the same subject was conducted by the Economic Intelligence Unit, which ranked 60 countries by their e-business environment and connectivity (EIU 2000). The study found the top 20 countries to be ready for e-business, the second twenty as

having the potential to catch up with those who are ready, and the bottom third as facing the risk of being left behind. According to this study, with the exception of Hong Kong and Singapore, the fifteen most e-ready countries are from Western Europe and North America. Except for South Africa, all African countries are in the bottom third of the e-readiness rankings.

Another proxy metric that has been used to gauge e-business readiness is the distribution of Secure Socket Layer (SSL). According to Netcraft, an online company which conducts surveys to determine the distribution of SSL around the world, SSL is "a protocol developed by Netscape for encrypted transmission over TCP/IP networks. It sets up a secure end-to-end link over which http or any other application protocol can operate. The most common application of SSL is https for ssl-encrypted http". Secure servers are essential for business transactions and hence a pre-requisite for e-commerce. Therefore, distribution of SSL serves as a direct measure of technological readiness for e-commerce, and as a proxy measure for the prevalence of e-commerce in a country.

The survey conducted in 1998 (Netcraft 1998) indicates that nearly 72% of the SSL servers are located in the US. With the exception of Japan (#6) and South Africa (#14) the fifteen countries with the highest number of SSL servers are from North America and Western Europe.

The surveys discussed here confirms the three tier world system. The greatest beneficiaries of ICT are the countries of the North. There is a middle tier of countries capable of adopting the new technology and benefit from it in the future. There is also a real danger of a number of low income countries (and some middle income countries like Russia) being altogether left behind broader ICT revolution dominated by the North.

It is recognized that there are no quick fixes for structural changes that are necessary to enable e-readiness in many low-income countries -- such as improving literacy, both basic and techno-digital literac. However, it is within the reach of state of the art technology to expand technological possibilities for the development of content, browsers and user interfaces that are more user friendly to those who are excluded from the digital world at this time. For instance, multi-modal user interfaces capable of speech recognition that can recognize verbal requests and deliver an *audio* translation of the content in the indigenous language could go a long way in responding to some of the pressing needs that face the marginalized.

### 3.5. Cash: Investment in Information Infrastructure & Research and Development

The long-term trend in connectivity of any country will depend on current efforts to build a nationwide information infrastructure and ongoing Research and Development in ICTs. Spending on ICT in general, and investments in information infrastructure and R& D arenas in particular, provide reasonable proxy measures for the long-term prospects of growth in connectivity.

In terms of the aggregate spending on ICT, many middle income countries are growing at rates larger than the established ICT players. For instance, Latin America has seen growth of over 13% in ICT spending during the period seven year period from 1992 to 1999. The comparable rates for Western Europe is 6.2% (WITSA 2000).

Recent studies conducted by Analysys, InfoDev and World Bank (World Bank 2000) for 59 countries is summarized in Table 3-6. Significant disparities are apparent in the investments (both in R&D as well as information infrastructure) of high-income countries and their low-income counterparts. OECD spends 9 times as much as Sub-Saharan Africa on Research and Development, and 12 times as much on information infrastructure.

In sum, the wide disparity in the investment pattern of the poorest and the richest countries indicates that the existing disparity in access between the two ends of the spectrum is likely to grow, rather than diminish in the near future. While data for the spending patterns of middle income countries suggest that the gap between the middle of the spectrum and the high-income countries may decline as a result of sustained higher investments by the former.

**Table 3-6: Investment in Information Infrastructure and R&D**
Source: infoDev: http://www.infoDev.org/library/working.html

| Region | Investment in Information Infrastructure (per Capita US $) | R&D as % GDP |
|---|---|---|
| | 2000 | 1992-1997 |
| OECD | 94.38 | 1.8 |
| Middle East | 24.57 | 0.4 |
| East Asia | 26.07 | 0.8 |
| Latin America and Caribbean | 38.78 | 0.5 |
| Eastern Europe & Transition Economies | 18.96 | 0.9 |
| Sub-Saharan Africa | 7.92 | 0.2 |
| South Asia | 4.67 | 0.8 |

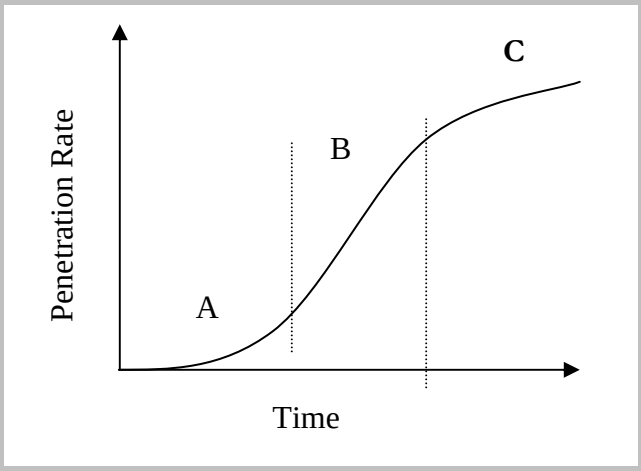
**4. SUB-NATIONAL DIFFERENCES: Digital Divide or Temporary Chasm?**

Previous sections looked at disparities in Internet usage at the national level. We need to pay equal attention to differences within countries. As discussed below, there are significant sub-national disparities. Some argue that these differences signify a divide that requires active intervention from the state to rectify. It is claimed that without proactive policy initiatives the evolution of ICT under market forces will only compound and deepen existing hierarchies and inequalities.

There is no consensus on this approach. Other commentators have suggested that Any disparity we now observe need not signify a rigid division but the differences in the rate at which different segments assimilate new technologies. Internet has spread at an unprecedented rate and therefore, any trends we observe may be misleading and exaggerated. These disparities are transient and with time will dissolve by themselves without the need for external intervention (see Box 4-1). The following section investigates the validity of these claims by examining the available data. Following are some of the critical sub-national dimensions of the digital disparities:

- Income
- Gender
- Age Structure
- Education Level
- Geographic location of user

**Box4-1 : Adoption Rates: the S-Curve**




Above is the S-Curve pattern typically observed in adoption of new technologies by societies. Initially there is a rapid expansion of the number of users from a low base as the technology is introduced (Region A). This is followed by a reduction in growth rate since new additions are over a larger base (Region B) and eventually penetration reaches its saturation point (Region C).

Consider two groups, Group I and Group II, receiving a technology with Group I starting earlier than Group II. The inevitable saturation of the penetration rate of Group I allows a latecomer, Group II, to catch up eventually.

### 4.1. Income

Income level seems to be a critical factor in determining Internet access. Table 4-1 shows tele-density as a function of income for three countries, namely, Panama, Nepal and South Africa. The data was obtained from the Living Standard Measurement Survey (LSMS) at the World Bank (quoted in World Bank 2000). In South Africa, households in the wealthiest quintile are 125 times more likely to have private telephones than those in the poorest quintile. In developed countries the disparity is less stark but still significant. OECD (2000) presents the difference in PC penetration rates in France and Japan between the highest income groups (annual income greater than US $70,000 and US $73,500 respectively) and the lowest income groups (annual income less than US $4,600 and US $9,100, respectively). The penetration rate for the highest income groups is approximately 7 times larger than that for the lowest income groups.

**Table 4-1: Tele-density by Income Level and Location**

| Country | Poorest Quintile | Quintile 2 | Quintile 3 | Quintile 4 | Wealthiest Quintile | % of Urban Households with Telephone | % of Rural House holds with Teleph one |
|---|---|---|---|---|---|---|---|
| Nepal | 0 | 0 | 0 | 0.5 | 11.0 | 10.38 | 0.11 |
| Panama | 1.7 | 11.0 | 27.5 | 51.5 | 73.8 | 57.45 | 9.27 |
| South Africa | 0.6 | 4.7 | 14.7 | 33.3 | 75.0 | 45.66 | 4.71 |

For the United States, extensive documentation is available for the correlation between income and Internet access. Data published by the US Department of Commerce (2000) indicate that Internet penetration for all income levels have risen. At the lowest income level (under $15,000) penetration level increased from 7.1% in 1998 December to 12.7% in 2000 August (a 79% increase); during this same period Internet penetration at the highest income level (above $75,000) increased from 60.3% in to 77.7% (a 17% increase).

Growth in Internet penetration rates in the US are observed to be higher at lower income levels compared to the growth in penetration at higher income levels during the period between December 1998 and August 2000. However the disparity in penetration rates between the highest income level and the lowest income level increased from 53.2% to 65% during this period.

### 4.2. Gender

Current data on the percentage of women using the Internet in selected countries is presented in Table 4-2. In the US women have achieved parity; in most countries gender gap persists with Ethiopia and Senegal showing the highest disparities. We should recognize that there is no correlation between national income level and the extent of the gender gap. As suggested by Table 4-2, Zambia (36%), South Korea (42%) and Latin American Region (38%) show better parity than France (33.4%), Germany (31.7%) and United Kingdom (35.9%). It should be recognized though, as per our discussion on Section 1, that comparison across different surveys may be inaccurate as the definition of the user (e.g. lower limit of age, and frequency of use) may differ from survey to survey.

**Table 4-2: Women Online as Percentage of the Total Internet Population**

| Country | % of Women Online | Source |
|---|---|---|
| Ethiopia | 14 | CABECA survey reported in World Bank (2000) |
| France | 33.4 | Media Metrix & Jupiter Communications; As of August 2000 |
| Germany | 31.7 | Media Metrix & Jupiter Communications; As of August 2000 |
| Latin America | 38 | Wall Street Journal |
| Senegal | 17 | CABECA survey reported in World Bank (2000) |
| South Korea | 42 | Korean Network Information Center, Reported in Nua Internet Surveys; Oct 12, 2000. http:www.nua.ie/surveys/?f=VS&art_id=905356101&rel=true |
| Sweden | 44.2 | Media Metrix & Jupiter Communications; As of August 2000 |
| United Kingdom | 35.9 | Media Metrix & Jupiter Communications; As of August 2000 |
| United States | 50.1 | Media Metrix & Jupiter Communications; As of August 2000 |
| Zambia | 36 | CABECA survey reported in World Bank (2000) |

**Trends in the use of Internet by Women**

Extensive data on the demography of users by gender is not available for all countries. The US is an exception. Surveys by Media Metrix and Jupiter Communications show the disparity to have steadily declined since 1995 -- from 38.1% female users in 1995 to the current 50.1% (Table 4-3).

It is true that the attainment of gender parity in Internet use in the US did not involve any directed intervention. However, this achievement was predicated on several factors, including i) high literacy and digital literacy rates for women; ii) the status of women in the social structure, and correspondingly the availability of relevant content; and finally iii) the affordability of Internet access, and women's ability to control their disposable income. The congruence of these factors is linked to the specificities of the US context.

Therefore, this trajectory need not be inevitable for all other countries. However, it is an instructive example because the conditions which helped to close the digital gap for women in the US, involved a complex public policy framework aimed at women's equity in accessing education, equal pay, etc. This example also suggests that addressing the digital divide bas to go beyond the confines of ICT to the broader social context.

**Table 4-3: Percentage of Female Internet Users**
Source: Media Metrix and Jupiter Communications

| Year | % of Female Users |
|---|---|
| 1996 | 38.1 |
| 1997 | 45.4 |
| 1998 | 47.5 |
| 1999 | 49.7 |
| 2000 | 50.1 |
| 2005 | 50.9 |

### 4.3. Age Structure

In several countries, older people are much less likely to access the Internet compared to younger ones. For instance, Australians in the age group 18-24 are five times more likely to access Internet than those above the age of 55 (OECD 2000, Source: Australian Bureau of Statistics 1999). According to the Human Development Report 1999, the average age of the Internet user in the US is 36 years, while in China and the United Kingdom it is 30 years.

By the mid 80's there was widespread use of the Internet among college students in the developed world, a group that is in its 30's now. Those who are above 40 may not have encountered Internet technology during their college days and hence may not have become digital literates. This can be observed in the Australian data, in which beyond age 40, access rate shows a rapid decline.

There is a clear trend increase for all age groups in the developed world. For instance, in Australia, between May 1998 and May 1999, there is at least a 6% increase in penetration for all age groups below 55 years. According to the US Department of Commerce, Internet penetration rates for all ages between 9 and 50 are well above the overall national average penetration. For those above 50, these rates increased from 19.3% in December 1988, to 29.8% in August 2000. Yet, since the growth rates of younger age-groups accessing Internet are much higher (53.4% to 56.8%) than that of the older group, the access gap between the old and young may continue to expand in the short term.

It should be noted that for those in the above 50 age-group, participation in the labor force has significant impact – those in the labor force have penetration rate of 46.4%, a figure which is almost three times that of those who are not in the labor force, 16.6%. This suggests that the lower penetration rates for the above 50 age-group reflects age as well as labor force attachment.

### 4.4. Level of Education of the Users

Historically, the Internet began as a medium of communication between academic institutions (and military institutions) in the US. Before the 90's it was overwhelmingly populated by techno-literates from colleges. With the introduction of the world wide web and commercialization of access to Internet in the early 90's, the user base some what broadened. However, the preponderance of highly educated users persists globally.

In Africa, the 1998 study of Capacity Building for Electronic Communication in Africa (CBECA) found that 87% of the Zimbabwean and 98% of the Ethiopian Internet users had university degrees (sited in World Bank, 2000). In Australia, 34% of those with a university education access computer from home compared to approximately 12% of those who had up to secondary education (ibid). In Canada, head of households with university degrees are more than 7 times more likely to use a PC compared to households headed by those with less than high school education (sited in OECD 2000, source Statistics Canada, 1999).

The contribution of education level to Internet use stems from three factors: i) the level of education is often correlated to digital literacy; ii) the level of education is correlated to social capital, i.e., social networking among peers, as peer usage of Internet influences non-users to become users; and iii) level of education is also correlated to income and the ability to afford Internet access.

US data (US Commerce Department, 2000) provides some evidence for the complex interaction among these three factors. Consider households headed by those with less than high school education. Internet access rate depends on the level of income and ranges from less than 5% when income is less than $15, 000 per annum income, to 51% when income is above $75,000 per annum (while the national average rate of Internet penetration for this education level of householder is 11.7%). *Clearly, this tenfold increase in penetration rates shows that income plays a major role when we look at penetration rates by education levels.*

However, it becomes clear that house hold income alone does not explain the impact of education of the householder. If we consider households with income levels above $75,000 per annum (with average penetration rate of 77%), penetration rates of households headed by individuals with education level that is less than high school is 51%, while for those headed by individuals with college degrees is 82%. This 31% spread clearly shows the role of digital literacy and social capital.

### 4.5. Geographic Location

In this Section, we examine the relationship of Internet/ICT penetration and the geographic location within countries. Urban centers generally have better infrastructure and higher levels of income compared to rural areas. Does the geography of ICT penetration mirror the center vs. periphery map of economic development? More broadly, are there any differences in the rural/urban divide between high-income countries and low-income countries? In probing these questions at greater depth, this section focuses on three case studies, namely, India and African continent and the United States.

In many low-income countries the income levels of different regions and the levels of infrastructure development are directly correlated. Table 4-4 presents the telephone density (per 100 people) of 14 states in India for the years 1997 through 2000 (Source: Indian Department of Telecom, presented in http://www.indiastrategy.com/dotcom-2.htm). It shows that all states show improving trends in tele-density during this period. Punjab, which is a relatively higher income state, registers an increase of 85% from 3.34 to 6.18, while one of the least well-to-do states Bihar also registers a substantial increase of 64% from 0.36 to 0.59. Yet *the absolute and the relative difference between the rich state and the poor state has also increased* – the teledensity of Punjab was 9.3 times that of Bihar in 1997 and 10.5 times that of Bihar in 2000.

This situation is not specific to India. Consider the case of the African continent. Twenty six of the fifty four countries and territories in Africa have Point of Presence in only one city, and only fifteen countries have dialup Internet access nationwide (Jensen, 2000a). In other words, it is common for the capital city, where the economic activity is concentrated, to be the only location with Internet access in the whole country. National development policy imperatives and lack of resources leave those outside the main cities without the organization and infrastructure to access the Internet. *Undoubtedly, this digital centralization only replicates and deepens the broader map of economic, political and infrastructure centralization.*

Is the situation the same in developed countries? There are some similarities but critical differences exist. In the case of US, the percentage of house holds with Internet access is the lowest in Arakansas (26.5%), a poor state, which is slightly less than half of that in New Hampshire (56%), a relatively wealthier state (US Department of Commerce 2000). Here too, the poorer areas are lagging in Internet penetration compared to their richer counter parts. Unlike the African situation, Internet penetration shows an increasing trend in both rural and urban households. In 2000, 42.3% of the urban households nationwide have Internet access, the corresponding rate for the rural households is a close 38.9%. The penetration has increased from the 1998 values of 27.5% and 22.2% for urban and rural households, respectively. However, unlike in India, the gap between the urban and rural household access in the US has declined from 5.3% to 3.4% between 1998 and 2000.

**Table 4-4: Tele-density Variation Across States of India**

Source: Indian Department of Telecom

| State | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|
| Punjab | 3.34 | 4.1 | 5.03 | 6.18 |
| Maharashtra | 3.38 | 3.92 | 4.55 | 5.28 |
| Kerala | 2.67 | 3.22 | 3.88 | 4.68 |
| Tamil Nadu | 2.14 | 2.57 | 3.09 | 3.72 |
| Gujarat | 2.44 | 2.79 | 3.19 | 3.64 |
| Haryana | 2 | 2.36 | 2.8 | 3.31 |
| Karnataka | 1.98 | 2.34 | 2.76 | 3.26 |
| Rajasthan | 1.32 | 1.65 | 2.06 | 2.57 |
| Andhra Pradesh | 1.35 | 1.59 | 1.87 | 2.2 |
| Madhya Pradesh | 1.06 | 1.27 | 1.52 | 1.82 |
| West Bengal | 0.96 | 1.09 | 1.23 | 1.39 |
| Uttar Pradesh | 0.68 | 0.83 | 1.02 | 1.25 |
| Orissa | 0.59 | 0.69 | 0.82 | 0.96 |
| Bihar | 0.36 | 0.43 | 0.5 | 0.59 |

It is rather interesting to note that among rural households in the US, there is a significant variation in Internet access rates depending on the level of income. Households with over $75,000 income have penetration rates over 76.6% while the corresponding rate for households with income less than $15,000 (below poverty level) is 11.3%. Even more interesting is the fact that the national average for penetration rates at the higher income level is 77.7%, indicating that at high-income levels the urban – rural distinction is almost irrelevant in the context of the US. This suggests that *in the case of the US, the differences arising from geographical location is not correlated to infrastructure, as much as it is to income differences*. Table 4-5 confirms this hypothesis.

**Table 4-5: Percent of U.S. Households with a Telephone**
Source: US Department of Commerce, 1999

| Income Level | U.S. | Rural | Urban |
|---|---|---|---|
| Under $5,000 | 78.7% | 76.7% | 79.2% |
| $35,000-$49,000 | 97.8% | 97.4% | 98% |
| Above $75,000 | 98.9% | 98.5% | 98.9% |

The existence of extensive communication infrastructure in rural areas of the U.S. is grounded in the history of U.S. telecom policy: (i) In regulating the telephone industry, the federal government tied the granting of licenses to provisions for universal access. In the 1920s this policy framework laid the terms for a public-private partnership where the government granted AT&T a monopoly license in providing telephone services nationwide - and in exchange, required that AT&T provide universal access (i.e. the company was required to provide telephone services to anyone who wanted it at an affordable rate by laying out telephone lines all over the county and provide a single unified national standards for telecommunication). (ii) More recently, policy initiatives by the government prioritized widespread Internet access. Largely as a result of this approach, all major long distance providers (e.g AT&T, MCI and Sprint) and local telephone service providers (e.g. Verizon) have become ISPs as well. Thus telephone services were already available in all rural areas and the same telephone service providers were able to then expand that reach to provide Internet access as well. As a result, connectivity became essentially a question of affordability. This is in direct contrast to India or many countries in Africa, where even those who can afford access in the rural areas cannot have access because of lack of infrastructure, and or ISP providers willing or able to serve those regions.

In sum, we need to recognize that there may be market momentum towards centralization. In this context, we may need to structure the regulatory framework to use licenses and other policy instruments to ensure that services are provided to those regions and populations without “intrinsic” economic incentives that would naturally draw in those services.

## CONCLUSIONS

All countries on the face of the earth are now permanently connected to the Internet. The Internet is growing at a rate unprecedented in the history of any technology. Yet significant disparities in access to the Internet exist along the lines of national income of countries.

The impact of ICTs is best understood in terms of three tiers of countries. The top tier is constituted by those countries that have the economical and technical resources to adopt and utilize the ICTs to exploit their full potential (most countries in the North fall in to this category); the middle tier is constituted by those countries that are capable of adopting and adapting over the next few years (here we count the mostly middle income countries in Latin America, East Asia, and Eastern Europe but also some low-income countries such as India), and the third tier is constituted by those countries that are in danger of being left behind altogether in the ICT revolution (Sub-Saharan Africa.

The cost of access to the Internet continues to decline in the North, and in many of the middle tier countries; however, this decline is yet to translate into affordable access for many countries of the South. Proactive policy interventions at the international level (peering and transit arrangements), at the national level (telecommunication tariffs), and at the local level (promoting and providing for collective access) may be necessary in many instances to make the Internet accessible to a wider segment of the population.

In addition to the inter-country divide, critical sub-national disparities exist across all countries, including the North. As the closing of the gender digital gap in the US suggests, addressing the digital divide has to go beyond the confines of ICT to the broader social context. Similarly, the study of income also emphasizes that disparities are most likely to be bridged if we address multiple dimensions simultaneously. Thus while income of individuals/households is a major source of the intra-national disparities, the data also showed that income is also correlated to other dimensions of disparity, such as gender, level of education and location of users. Ultimately the intersection of these different dimensions emerges as very important in evaluating the significance of any one dimension. Thus, geographic location based disparity is insignificant in the North if the effects of income are isolated. However, geographic location becomes a source of disparity in the absence of adequate infrastructure in the rural areas in the South.

However, one tentative generalization is that the three tier analysis suggested above for the international level also obtains at the national level in many countries. At both the international and national level, it is the middle tier that is likely to benefit most from the received repertoire of policy initiatives to encourage ICT diffusion. To reach the third tier we would require not only extensive resource investment, but particularly imaginative and experimental initiatives.

**ACKNOWLEDGEMENTS**
Author wishes to acknowledge the abundant help he received from peers and colleagues in obtaining current data on the different dimensions of the Digital Divide. Laura Mourino Cass, Haishan Fu, Claes Johansson, and Raul Zambrano of the UNDP; Tim Kelly, Dalia Mendiluce, and Michael Minges of the ITU; Matt Brosius of the OECD, David Cieslikowski and Christine Qiang of the World Bank and Charles Kenney of the InfoDev all provided invaluable information that made this research a productive exercise. Input from Sakiko Fukuda-Parr and Kate Raworth helped this paper take the present form.

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# APPENDIX

**Table A-1: Top 15 Countries in Internet Use at Year-End 1999**
(source: Computer Industry Almanac, http://www.c-i-a.com/199911iu.htm)

| Rank | Country | Users (Millions) |
|---|---|---|
| 1 | USA | 110.8 |
| 2 | Japan | 18.2 |
| 3 | U.K. | 14.0 |
| 4 | Canada | 13.3 |
| 5 | Germany | 12.3 |
| 6 | Australia | 6.8 |
| 7 | Brazil | 6.8 |
| 8 | China | 6.3 |
| 9 | France | 5.7 |
| 10 | South Korea | 5.7 |
| 11 | Taiwan | 4.8 |
| 12 | Italy | 4.7 |
| 13 | Sweden | 4.0 |
| 14 | Netherlands | 2.9 |
| 15 | Spain | 2.9 |

**Table A-2: Top 15 Countries in Internet Penetration Rate at Year-End 1999**
(source: Computer Internet Industry Almanac, October 2000: http://www.c-i-a.com/200010iu.htm)

| Rank | Country | Users/1000 Population |
|---|---|---|
| 1 | Canada | 428.20 |
| 2 | Sweden | 414.15 |
| 3 | Finland | 408.04 |
| 4 | U.S. | 406.49 |
| 5 | Iceland | 403.46 |
| 6 | Denmark | 395.97 |
| 7 | Norway | 379.59 |
| 8 | Australia | 343.27 |
| 9 | Singapore | 310.77 |
| 10 | New Zealand | 264.90 |
| 11 | Netherlands | 255.55 |
| 12 | Switzerland | 245.81 |
| 13 | United Kingdom | 236.41 |
| 14 | Taiwan | 216.82 |
| 15 | Hong Kong | 212.91 |
| | Average of Top 15 Countries | 328.16 |
| | Worldwide Average | 46.75 |

**Table A-3: Government Web-Sites**
Source: http://www.gksoft.com/govt/en/world.html

| Country or Territory | Number of entries | filesize (in kB) | date of last change |
|---|---|---|---|
| Germany | 1636 | 234 | 8/29/00 |
| Great Britain and Northern Ireland | 1158 | 123 | 8/31/00 |
| United States of America | 828 | 84 | 8/23/00 |
| France | 594 | 99 | 8/31/00 |
| India | 572 | 71 | 8/31/00 |
| Italy | 559 | 87 | 8/28/00 |
| Spain | 526 | 86 | 8/30/00 |
| Sweden | 515 | 69 | 8/29/00 |
| Brazil | 357 | 59 | 4/30/00 |
| Switzerland | 330 | 72 | 8/27/00 |
| Netherlands | 328 | 52 | 8/29/00 |
| Austria | 266 | 43 | 8/26/00 |
| Denmark | 266 | 39 | 8/22/00 |
| Japan | 264 | 31 | 8/27/00 |
| Canada | 262 | 50 | 8/23/00 |
| Australia | 252 | 30 | 8/22/00 |
| Mexico | 250 | 42 | 6/30/00 |
| Portugal | 242 | 42 | 3/4/00 |
| Argentina | 233 | 42 | 8/12/00 |
| Belgium | 213 | 42 | 8/24/00 |
| China (Republic) | 205 | 26 | 6/29/00 |
| Finland | 198 | 27 | 8/25/00 |
| Malaysia | 187 | 29 | 8/28/00 |
| Norway | 181 | 28 | 8/24/00 |
| New Zealand | 168 | 24 | 6/25/00 |
| South Africa | 159 | 23 | 8/28/00 |
| European Union | 154 | 24 | 8/29/00 |
| Korea (Republic) | 143 | 21 | 8/15/00 |
| Thailand | 141 | 20 | 8/17/00 |
| Philippines | 139 | 21 | 8/29/00 |
| Hong Kong | 135 | 18 | 6/16/00 |
| Ireland | 132 | 23 | 6/11/00 |

| Israel | 115 | 18 | 8/25/00 |
|---|---|---|---|
| Poland | 112 | 22 | 8/27/00 |
| **Country or Territory** | **Number of entries** | **filesize (in kB)** | **date of last change** |
| Greece | 107 | 16 | 5/27/00 |
| Chile | 106 | 20 | 8/12/00 |
| Russian Federation | 104 | 17 | 8/29/00 |
| Estonia | 103 | 16 | 8/24/00 |
| Singapore | 101 | 15 | 8/24/00 |
| Turkey | 100 | 19 | 8/24/00 |
| Indonesia | 98 | 18 | 8/29/00 |
| Colombia | 86 | 17 | 8/17/00 |
| Czech Republic | 83 | 15 | 6/24/00 |
| Slovenia | 82 | 16 | 8/22/00 |
| Hungary | 80 | 17 | 8/31/00 |
| Peru | 69 | 15 | 4/30/00 |
| Venezuela | 69 | 16 | 8/25/00 |
| China (People's Republic) | 66 | 12 | 7/29/00 |
| Iceland | 65 | 13 | 1/2/00 |
| Luxembourg | 65 | 16 | 5/27/00 |
| Croatia | 60 | 12 | 6/22/00 |
| Romania | 60 | 14 | 8/31/00 |
| Pakistan | 59 | 11 | 5/27/00 |
| Uruguay | 56 | 13 | 8/30/00 |
| Latvia | 54 | 11 | 7/15/00 |
| Malta | 51 | 11 | 8/24/00 |
| Lebanon | 48 | 11 | 8/24/00 |
| Mauritius | 48 | 10 | 11/27/99 |
| Slovakia | 48 | 11 | 8/26/00 |
| Yugoslavia | 48 | 12 | 8/29/00 |
| Lithuania | 47 | 10 | 1/22/00 |
| Bulgaria | 46 | 9 | 7/30/00 |
| Jamaica | 44 | 10 | 6/25/00 |
| Brunei | 43 | 9 | 1/22/00 |
| Morocco | 43 | 10 | 8/6/00 |
| Panama | 43 | 11 | 8/31/00 |
| Palestine | 42 | 9 | 8/29/00 |

| Country or Territory | Number of entries | filesize (in kB) | date of last change |
|---|---|---|---|
| Paraguay | 42 | 12 | 8/31/00 |
| Ecuador | 40 | 11 | 8/28/00 |
| Algeria | 38 | 9 | 8/30/00 |
| Arab Emirates | 38 | 9 | 8/6/00 |
| Costa Rica | 38 | 10 | 3/5/00 |
| Puerto Rico | 38 | 11 | 6/28/00 |
| Iran | 36 | 9 | 8/27/00 |
| Bosnia and Herzegovina | 35 | 10 | 8/26/00 |
| Dominican Republic | 35 | 11 | 8/26/00 |
| Egypt | 35 | 9 | 8/22/00 |
| Nepal | 32 | 9 | 8/25/00 |
| Sri Lanka | 32 | 9 | 8/12/00 |
| Bolivia | 31 | 9 | 8/25/00 |
| Mongolia | 30 | 8 | 3/29/00 |
| Ukraine | 30 | 8 | 7/18/00 |
| Bangladesh | 29 | 8 | 6/4/00 |
| Macedonia | 27 | 8 | 7/28/00 |
| El Salvador | 26 | 8 | 1/15/00 |
| Guyana | 26 | 7 | 8/31/00 |
| Iraq | 26 | 7 | 8/24/00 |
| Jordan | 26 | 7 | 6/9/00 |
| Trinidad and Tobago | 26 | 8 | 5/14/00 |
| Barbados | 25 | 8 | 5/16/00 |
| Cuba | 25 | 9 | 8/26/00 |
| Cyprus (Republic) | 25 | 8 | 9/20/99 |
| Nicaragua | 24 | 8 | 12/14/99 |
| Andorra | 23 | 7 | 6/22/00 |
| Guatemala | 23 | 8 | 1/15/00 |
| Ghana | 22 | 7 | 8/31/00 |
| Papua New Guinea | 22 | 7 | 7/28/00 |
| Faroes | 21 | 6 | 5/22/00 |
| Greenland | 21 | 7 | 7/13/99 |
| Uganda | 21 | 7 | 6/27/00 |
| Cambodia | 20 | 7 | 8/6/00 |

| Country or Territory | Number of entries | filesize (in kB) | date of last change |
|---|---|---|---|
| Antilles, Netherlands | 19 | 6 | 8/26/00 |
| Ethiopia | 19 | 7 | 8/27/00 |
| Guam | 19 | 5 | 8/31/99 |
| Guernsey | 19 | 5 | 5/28/00 |
| Kuwait | 19 | 6 | 4/19/00 |
| Namibia | 19 | 7 | 8/31/00 |
| Jersey | 18 | 6 | 8/11/00 |
| Honduras | 17 | 8 | 8/17/00 |
| Kazakhstan | 17 | 7 | 8/6/00 |
| Liechtenstein | 17 | 7 | 8/6/00 |
| Man | 17 | 6 | 5/12/00 |
| Senegal | 17 | 7 | 8/25/00 |
| Aland | 16 | 4 | 1/9/00 |
| Armenia | 16 | 6 | 8/30/00 |
| Belarus | 16 | 7 | 8/4/00 |
| Kyrgyzstan | 16 | 7 | 8/2/00 |
| Saudi-Arabia | 16 | 6 | 8/25/00 |
| Angola | 15 | 7 | 5/22/00 |
| Georgia | 15 | 6 | 8/15/00 |
| Micronesia | 15 | 6 | 5/9/00 |
| Albania | 14 | 7 | 8/2/00 |
| Aruba | 14 | 5 | 9/25/99 |
| Cameroon | 14 | 8 | 11/7/99 |
| Mozambique | 14 | 7 | 8/26/00 |
| Sudan | 14 | 6 | 8/12/00 |
| Virgin Islands, British | 14 | 5 | 7/29/00 |
| Bahrain | 13 | 6 | 7/29/00 |
| Nigeria | 13 | 6 | 8/29/00 |
| Northern Mariana Islands | 13 | 5 | 4/30/00 |
| San Marino | 13 | 6 | 8/5/00 |
| Uzbekistan | 13 | 6 | 5/26/00 |
| Yemen | 13 | 6 | 8/29/00 |
| Azerbaijan | 12 | 6 | 8/28/00 |

| Country or Territory | Number of entries | filesize (in kB) | date of last change |
|---|---|---|---|
| Burkina Faso | 12 | 7 | 8/27/00 |
| Fiji | 12 | 6 | 3/17/00 |
| Macau | 12 | 6 | 6/25/00 |
| Moldova | 12 | 6 | 8/31/00 |
| Saint Lucia | 12 | 6 | 11/27/99 |
| Zimbabwe | 12 | 6 | 6/29/00 |
| Kenya | 11 | 6 | 4/29/00 |
| Myanmar | 11 | 6 | 8/22/00 |
| New Caledonia | 11 | 5 | 8/11/00 |
| Vietnam | 11 | 6 | 6/27/00 |
| Haiti | 10 | 6 | 7/17/00 |
| Madagascar | 10 | 7 | 1/10/00 |
| Oman | 10 | 6 | 12/28/99 |
| Syria | 10 | 6 | 8/24/00 |
| Tunisia | 10 | 6 | 3/9/00 |
| Belize | 9 | 6 | 8/30/00 |
| Bermuda | 9 | 5 | 6/24/00 |
| Cote d'Ivoire | 9 | 6 | 7/14/00 |
| Gibraltar | 9 | 4 | 7/19/00 |
| Bahamas | 8 | 6 | 5/16/00 |
| Cyprus (Turkish Republic) | 8 | 4 | 3/7/00 |
| Gabon | 8 | 6 | 3/10/00 |
| Maldives | 8 | 6 | 3/9/00 |
| Saint Kitts and Nevis | 8 | 5 | 5/16/00 |
| Tanzania | 8 | 5 | 11/8/99 |
| Zambia | 8 | 5 | 1/17/00 |
| Congo (Democratic Republic) | 7 | 6 | 3/9/00 |
| Mauritania | 7 | 6 | 7/29/00 |
| Qatar | 7 | 5 | 6/27/99 |
| Suriname | 7 | 5 | 1/7/00 |
| Dominica | 6 | 5 | 6/28/00 |
| Lesotho | 6 | 5 | 8/2/00 |

| Country or Territory | Number of entries | filesize (in kB) | date of last change |
|---|---|---|---|
| Malawi | 6 | 5 | 9/29/99 |
| Swaziland | 6 | 5 | 5/15/00 |
| Vatican | 6 | 5 | 6/29/00 |
| Afghanistan | 5 | 5 | 11/7/99 |
| Guinea | 5 | 5 | 8/11/00 |
| Mali | 5 | 5 | 6/19/00 |
| Seychelles | 5 | 5 | 12/6/98 |
| Anguilla | 4 | 4 | 5/16/00 |
| Antigua and Barbuda | 4 | 5 | 5/16/00 |
| Benin | 4 | 5 | 8/16/00 |
| Cook Islands | 4 | 4 | 6/9/00 |
| Grenada | 4 | 5 | 11/1/99 |
| Laos | 4 | 5 | 1/8/00 |
| Rwanda | 4 | 6 | 6/19/00 |
| Saint Vincent and the Grenadines | 4 | 5 | 9/25/99 |
| Samoa | 4 | 5 | 8/12/00 |
| Sierra Leone | 4 | 5 | 6/26/99 |
| Solomon Islands | 4 | 5 | 6/30/00 |
| Virgin Islands, U.S. | 4 | 4 | 8/29/00 |
| Botswana | 3 | 5 | 6/11/00 |
| Cape Verde | 3 | 5 | 4/11/99 |
| Chad | 3 | 5 | 8/27/00 |
| Congo (Republic) | 3 | 5 | 11/4/99 |
| Falkland Islands | 3 | 4 | 6/27/99 |
| Gambia | 3 | 5 | 8/25/00 |
| Liberia | 3 | 5 | 5/15/99 |
| Marshall Islands | 3 | 5 | 6/10/99 |
| Monaco | 3 | 5 | 6/20/00 |
| Montserrat | 3 | 4 | 6/30/00 |
| Niger | 3 | 5 | 1/2/99 |
| Samoa, American | 3 | 4 | 8/4/00 |
| Tonga | 3 | 5 | 4/30/00 |
| Turkmenistan | 3 | 5 | 8/2/00 |

| Country or Territory | Number of entries | filesize (in kB) | date of last change |
|---|---|---|---|
| Burundi | 2 | 5 | 12/20/99 |
| Cayman Islands | 2 | 4 | 5/16/00 |
| Central Africa | 2 | 5 | 1/30/99 |
| Libya | 2 | 5 | 3/9/00 |
| Niue | 2 | 3 | 1/13/00 |
| Polynesia, French | 2 | 4 | 8/28/00 |
| Saint Helena | 2 | 3 | 1/12/00 |
| Tajikistan | 2 | 5 | 6/4/00 |
| Togo | 2 | 5 | 1/3/00 |
| Bhutan | 1 | 4 | 7/14/98 |
| Comoros | 1 | 5 | 12/26/99 |
| Djibouti | 1 | 5 | 6/25/00 |
| Equatorial Guinea | 1 | 5 | 6/6/99 |
| Eritrea | 1 | 5 | 5/26/00 |
| Guinea-Bissau | 1 | 5 | 8/10/98 |
| Korea (People's Republic) | 1 | 5 | 3/9/97 |
| Mayotte | 1 | 3 | 1/9/00 |
| Palau | 1 | 4 | 12/9/97 |
| Pitcairn Islands | 1 | 3 | 8/10/98 |
| Saint-Pierre and Miquelon | 1 | 3 | 6/8/00 |
| Turks and Caicos Islands | 1 | 3 | 1/5/00 |
| Vanuatu | 1 | 4 | 5/15/99 |
| Wallis and Futuna | 1 | 3 | 11/4/98 |