

# Factors for Global Diffusion of the Internet

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## INTRODUCTION

There is overwhelming evidence that the use of the Internet-enabled applications and solutions provide unprecedented economic growth opportunities. However, the Internet diffusion rates remain low in many countries. According to the International Telecommunications Union (ITU), in 2004, less than 3% of the Africans used the Internet, whereas the average Internet subscription rate for G8 countries (Canada, France, Germany, Italy, Japan, Russia, the UK, and the US) is about 50%. Also, in nearly 30 countries the Internet penetration rates still remain below 1% (ITU, 2006). So, what are the key factors that explain this wide variation in Internet subscription rates in countries around the world? An understanding of these factors will be highly useful for policy makers, economic developmental agencies and political leaders in establishing and implementing suitable national developmental strategies and policies.

## BACKGROUND

The Internet is playing a pivotal role in the economic development of nations. The adoption of the Internet and related business applications such as e-business, voice over IP (VoIP), mobile commerce, and integrated supply chains have become the primary drivers of the growth of economic activities in many countries (Dedrick, Gurbaxani, & Kraemer, 2003; Kenny, 2003, Koh & Chong, 2002). For example, it is estimated that during the 1990's, investments in information and communication technologies contributed around 10 to 20 percent to the output growth of the economies of the countries such as Canada, Finland, and the United States (Lawrence, 2002). In fact, the recently published *Global Information Technology Report 2005-2006*, and *Global Competitiveness Report 2006-2007* attribute the enhanced degree of competitiveness of such high ranking economies as the United States, Singapore, Switzerland, and Nordic countries to their high levels of networked readiness and technological readiness. An important factor of technological readiness is the high level usage of the internet. *Global Technology Report 2006-2007* (p. 10) observes a positive correlation between the global competitiveness index for 2006-2007 and technological readiness index for 2005-2006 in a large number of countries

emphasizing the key role played by the usage of information and communication technology (ICT). Accelerated economic growth rates in India and China are also prime example of how ICT in concert with appropriate economic, intellectual property protection, and infrastructure improvement policies promote rapid economic development.

## GLOBAL INTERNET DIFFUSION FACTORS

Several factors have been observed to determine the penetration rates of the internet in various countries. These factors include the availability of reasonably-priced telecommunications infrastructure, access to personal computers, educational and training opportunities for individuals, income levels, and innovative capability of the country (Beilock & Dimitrova, 2003; Chinn & Fairlie, 2007; Dewan, Ganley, & Kraemer, 2006; Dholakia, Dholakia, & Kshetri, 2003; Kiiski & Pohjola, 2002; Oyelaran-Oyeyinka & Lal, 2005; Meijers, 2006; Murthy, 2004; Nath & Murthy, 2003, 2004). Also, the rule of law (e.g., property rights, strong legal system) governing the country's trading system, government regulations and market liberalization policies, and credible payment systems (e.g., credit cards, digital wallet, and cash) are necessary for migrating to digital commerce.

## Human Capital Development Factors

It is difficult to realize the full potential of the Internet if people cannot read or write or have a basic understanding of the computer and its functions. Therefore, an individual needs a minimum level of computer and language literacy to use the Internet and accrue its benefits. One way to assess this is to consider measures such as:

- a. Adult literacy rate
- b. Percent of school age children enrolled in schools
- c. Per capita spending on education

Many studies including those by Bali moune-Lutz (2003) and Nath and Murthy (2003) have concluded that literacy rates and tertiary enrollment are strong predictors of Internet diffusion. Also, literate population is more accepting of

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information and communication technology (ICT) innovations which subsequently lead to increased acceptance of advanced technologies such as the Internet.

### Technological Factors

Availability and reliability of the telecommunications infrastructure is clearly important for people to use the Internet. This includes the bandwidth, the number of Internet hosts, the reliability of electric power, and the percent of the population of a nation that have access the Internet. In addition, people who are familiar and comfortable with using other technologies such as a phone, a mobile phone and a personal computer are more likely to adopt and use the Internet. Specific variables that one may consider are:

- a. Number of personal computers per 100 inhabitants.
- b. Telephone lines per 100 inhabitants.
- c. Cell phone subscribers per 100 inhabitants
- d. Number bandwidth (bits) per capita
- e. Reliability of electrical power

One key aspect of the new economy is the availability of cost-effective information and communication technologies (ICT) and the above listed items represent leading indicators of ICT (Baliamoune-Lutz, 2003). Several studies have established that countries with higher penetration rates of personal computers, telephones, and mobile phones, sufficient bandwidth and reliable supply of electricity that powers most ICT devices, also tend to have more Internet users (Nath & Murthy, 2003, 2004).

### Economic Factors

How expensive is it to get an Internet connection? If the cost is prohibitively high relative to the income, then the Internet penetration rate is likely to be low. The two variables that are relevant here are:

- a. Real gross domestic product per capita (in US purchasing parity \$)
- b. Average monthly cost of 20 hours of Internet access.

Kiiski and Pohjola (2002) found that, across countries, GDP per capita and Internet access costs were the best predictors of growth in Internet hosts. Further, more recently Nath and Murthy (2004) using data from 62 countries, demonstrated that higher “average monthly cost of 20 hours of Internet access” had a significant negative impact on the Internet diffusion rates.

### Political Factors

A nation’s political and economic policies and environment are important in determining the diffusion rate of the Internet. Some nations restrict the use of the Internet (e.g., Iran and North Korea). Also, the economic policies of the government affect the extent to which citizens use the Internet. Variables that measure “political and economic” policies include:

- a. **Economic Freedom Index (EFI):** Beach and O’Driscoll (2003) define this index as the “... absence of government coercion or constraint on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself.” This index aggregates several factors covering broad issues such as corruption, non-tariff barriers to trade, the fiscal burden of government, the rule of law and efficiency of the judiciary, regulatory hurdles for businesses, labor market restriction, and black market activities. Complete details regarding the development and description of this index can be found in Beach and O’Driscoll (2003). The values of EFI can vary from 1 to 5. A value of 1 indicates set of national policies that promote economic freedom and a value of 5 signifies policies that are least conducive to economic freedom.
- b. **Innovation Capability of the Country:** This variable is calculated as the product of the number of patents granted per million inhabitants and gross tertiary enrollment rate. Note that the number of patents reflects the nation’s innovation intensity and the enrollment rates denote the degree of investment in human capital. Thus, this measure reflects a country’s capability, ability to provide a conducive environment for augmenting technological advance and its capacity for innovation in technologies and products (McArthur & Sachs, 2000).

In a study of the diffusion of the Internet across countries, Nath and Murthy (2003) have shown that both the economic freedom index and the innovation capability of a country play a positive role towards the diffusion of the Internet. These findings have been further supported by Baliamoune-Lutz (2003) and Nath and Murthy (2004).

### Cultural Factors

Cultural factors do impact the rate of diffusion of the internet. Culture is defined as: “the collective programming of the mind which distinguishes the members of one human group from another (Hofstede, 1991, p.5).” In his book titled *Culture’s Consequences*, Hofstede (1980) suggested four dimensions of culture.

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