The Global Diffusion of the Internet Project

An Initial Inductive Study

The MOSAIC Group

Members of the MOSAIC Group
who contributed to this study:

Seymour E. Goodman
Grey E. Burkhart
William A. Foster
Laurence I. Press
Zixiang (Alex) Tan
Jonathan Woodard

Abstract

This report proposes a framework for analysis of the diffusion and absorption of the Internet worldwide and applies that framework to an initial set of 13 diverse countries, nine of which are in proximity to the Persian Gulf. The framework's dimensions provide a vehicle for uniformly assessing both the extent and quality of Internet use and supporting infrastructure within a country. The determinants explain why the Internet developed the way that it did in each country, and provide a basis for assessing the prospects for the future. The analysis is directly related to issues of importance, particularly national security, to the governments concerned, and implications for U.S. national security are examined.

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Disclaimers

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The Internet addresses (URLs) provided in this report are accurate as of 1 February 1998. Due to the dynamic nature of the Internet, some Web pages will be removed and the URLs of other will be changed, perhaps in the very near term.

Executive Summary

This Initial Inductive Study of the Global Diffusion of the Internet Project provides a framework for describing the diffusion and absorption of the Internet that goes well beyond simply counting hosts, and an explanation of how the present capacity came about and how it is evolving. The framework comprises six *dimensions* of Internet diffusion, four categories of *determinants* of those dimensions, and the overall *government policy* that at once controls much of the environment for the diffusion of the Internet and is itself shaped by emerging capabilities, opportunities, and risks.

The framework has been applied to an initial set of 13 countries, chosen to provide a selection varied enough to broadly test the applicability and usefulness of the analytic framework, and to illustrate the wide range of concerns raised by the emergence and spread of the Internet. These countries are: Bosnia and Hercegovina, recovering from a long and bitterly-fought war; Cuba, hard-pressed economically in the post-Soviet world and cautiously embracing technologies that could boost its economy; Finland, a small, Western democracy with a surprising density of modern telecommunications infrastructure, as an example of extensive Internet diffusion; the People's Republic of China, attempting to modernize rapidly and liberalize economically while maintaining a Communist, centrist political structure; and finally nine countries in proximity to the Persian Gulf, an area of vast but greatly varied wealth, culturally and religiously conservative, and very much a "late comer" to the Internetted world.

KEY JUDGMENTS

- **The global diffusion of the Internet has been extraordinarily rapid and extensive**, but not as uniform or rampant as some people think.
- **The Internet has become an important issue on the agendas of most governments, with a growing set of stakeholders in most countries.** Governments are dealing with mixes of issues and constituents in different ways, and at different rates, but overall the Internet has an increasing presence almost everywhere.
- **The United States is, by far, the most visible object on the Internet "radar screen" of almost all other countries.** This presence extends over all technological, economic, political, cultural, and national security aspects of the Internet.
- **The "killer application" is electronic mail**, although there is extensive interest in the World-wide Web and its use for commercial purposes is increasing rapidly.

COUNTRY HIGHLIGHTS

- **Bosnia and Herzegovina**

  The Internet is barely present in Bosnia, but its presence is more surprising than its lack of development. The first connection was established during the war, but little has changed during the intervening years. During the war years, the principal users of the Internet were academics and non-governmental organizations (NGO). This situation also still pertains.

The PTT is in the process of establishing a nationwide commercial service, but continuing political divisions and an inadequate telecommunications infrastructure are hampering progress. Although Internet-related issues are well below the current threshold of issues requiring the government's attention, solution of such issues as the reuniting of the current three telephone networks (two of which are not sanctioned by the peace accords) will also facilitate Internet development.

- **Cuba**

  Although there is only minimal connectivity between Cuba's networks and the world at large, the island is surprisingly networked. These networks were created as government initiatives to develop such public services as telemedicine and computer literacy programs. The principal hindrances to the further development of Internet connections are government policy and lack of funds.

  The government is currently attempting to derive some economic gains from the Internet, such as through the promotion of tourism, but is still very leery of allowing the public unfettered access to alternative sources of information. Both to save money and limit the presence of the Internet on the island, the government's principal Internet Web servers are located off-shore. However, even if the government did not strictly limit Internet access, few people could afford to connect.

- **Finland**

  Largely as a consequence of Finland's early decision to only minimally regulate the telecommunications sector, the Internet has, in its turn, developed and proliferated rapidly. There are an unusually high number of telephone companies and Internet service providers (ISP) per capita, largely due to the open regulatory environment. In relative terms, Finland is one of the most, if not the most, Internetted country in the world.

  Two significant weaknesses of Finland's Internet, however, are the concentration of international links in the capital and the lack of multiple high-speed international communications channels. These weaknesses arise from circumstances beyond the control of any single country, including international communications agreements and balance-of-payment (cost) issues.

- **The People's Republic of China**

  Like Cuba, the PRC is one of the world's last remaining Communist countries and is attempting to reap the benefits of the Internet while avoiding the pitfalls. Unlike Cuba, the government has decided to aggressively pursue extensive nationwide and international connectivity. The Chinese Communist Party, in the interests of economic prosperity, is allowing the PRC to participate in the Internet. However, the Internet presents a major challenge to government decision-making. The government is struggling to keep central control over the Internet when no one organization of the State is able to claim it as its own. The internal security apparatus, itself inadequate numerically and technically for the task of Internet surveillance, has directed ISPs to act as the first line or surveillance and control. Officials have been reluctant to ban encryption because it is seen as a necessary requirement for electronic commerce, but believe that the government has the power to compel senders and receivers to provide copies of keys or unencrypted messages.

The ability of the Chinese government to solve infrastructure and regulatory problems is facilitating the diffusion of the Internet. The number of Internet users in China grew by 1,150 percent in 1996 and by approximately 800 percent in 1997. The government is funding Internet access to all provinces. All major universities around the country are connected. In the commercial sector, over 50 ISPs are investing in dial-up and leased-line infrastructure and competing for users.

As this report was in final preparation, rumors were emanating from the on-going (as of 3 March 1998) session of the National People's Congress to the effect that several of the key ministries involved in the diffusion of the Internet in China were going to be consolidated as part of a reorganization of the telecommunications sector and of the government more generally. If this comes to pass, competition will be significantly stifled.

- **The Persian Gulf Region**

  In January 1994, the Persian Gulf had no TCP/IP hosts when the rest of the world had over 2.2 million. By January 1995, Kuwait had modest, and Iran fairly minimal, connectivity. Now all but Iraq are connected, some with impressive growth percentages. But both the state of the Internet and the reasons for its presence and development vary greatly within the region. The United Arab Emirates has the most widely-deployed Internet infrastructure in the region and the most subscribers. Iraq, on the other hand, continues to abjure Internet connectivity out of fear that it will add to the regime's troubles.

  Iran was the first country in the region to join BITNET and the second to offer public Internet access. However, the degree of availability of that access has been variable due to government ambivalence about the Internet and correspondingly irregular shifts in policy. The development of the Internet has been hampered by the same confusion in government decision-making that constrains almost all other government functions. The revolutionary government has yet to develop a coherent policy due to the intransigence of its various constituencies, making long-term investments a gamble. Internet services are currently offered by a few ISPs and the Data Communication Company of Iran, a subsidiary of the Ministry of PTT. Iran's international connections to the Internet were up-graded in 1997 with the establishment of dedicated satellite links to Kuwait and Italy.

  The Saudi government initiated the most extensive examination of the applications and implications of the Internet of any country in the region. The resultant review process took about two years, and finally recommended that the country's Internet connection be managed from a single point and that a firewall be used to interdict Saudi citizens' access to material deemed inappropriate by the government. Public Internet service was approved in April 1997, but the modalities have yet to be worked out. There is currently an IP link via satellite between Saudi Arabia and the United States, which was originally set up for telemedicine applications, but Internet access is limited to a few government and academic institutions. Those who can afford it have accounts in other countries, especially Bahrain.

  In both Iran and Saudi Arabia, it was the academic community that first initiated an Internet connection. These early initiatives, however, were prevented by the governments from developing further. In Iran, in addition to security and public morals concerns, the state monopoly telecommunications company has been attempting to gain exclusive control over

data networking. The Iranian government's relationship with its people is relatively secure, but the government has yet to solve its internal inconsistencies. On the other hand, the reasons for the Saudi government's reluctance to implement Internet service are exclusively concerns about security and public morals. While the government speaks with one voice, the government's relationship with its people may not be as secure as it would like, necessitating continued controls over information dissemination.

RECOMMENDATIONS FOR FURTHER STUDY

- **That efforts be funded to address key issues and expand the analysis** over the next several years to form a truly global understanding of the history and diffusion of the Internet.
- **That a central database of relevant information be created and maintained as a community-wide resource.** Given the rapid proliferation of the Internet and equally rapid advances in the information technologies, specific, detailed information has proven to be very ephemeral. It is critical to the establishment of a historical view of the "information revolution," including the diffusion of the Internet and its contribution to that revolution, that developments be captured and stored as they occur.
- **That the framework be further refined** to establish a more explicit linkage between the dimensions and determinants on the on hand, and the issues of governance, national power, and national security on the other.

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