

Viewpoint

The World Bank Group

July 1997

Note No. 122

The Private Sector and the Internet

*Carlos A. Primo
Braga and
Carsten Fink*

Powerful forces are recasting the business world in a fleetier, more competitive form. These forces, largely grouped around information infrastructure and new communications technologies, have come to be known collectively as the information revolution. This Note is the fifth in a series of five that looks at the information revolution and the future of telecommunications—and what they mean for the regulatory role of government.

Advances in telecommunications and informatics have transformed the Internet from an academic experiment into a household name in most industrial countries. The number of computers connected to the Internet grew from 535,000 in July 1991 to close to 16 million by January 1997 (figure 1), and it is estimated that the number of Internet users has already exceeded 50 million. Although still concentrated in industrial countries, this “network of networks” is rapidly expanding in the developing world. Many now believe that it provides a window into a future in which access to information will be independent of geographic location and interactivity in a multimedia environment will be ubiquitous.

This article briefly reviews the history of the Internet and its evolution from an academic experiment into the main application behind the emerging global information infrastructure. It discusses the role of the private sector in these developments and the regulatory environment required for the Internet to fulfill its promise.

The rise of the Internet

The origins of the Internet can be traced to the 1960s, when the U.S. Department of Defense decided to fund the development of a packet-switching data network that would allow networked computers of different sizes and types to communicate efficiently. In packet-switching networks, data files are broken into small packages that are sent independently over the network and then reassembled at the final destination. This permits efficient use of communications lines because, unlike circuit-switching, an architecture typically used for voice telephony, it does not require an open, or point-to-point, connection. Packet-switching allows many users to share a circuit, with no particular connection dedicated for a given

communication session. And, it increases the network’s reliability.

The resulting network, Arpanet, began operation in 1969, linking four sites. In the 1970s, other government-supported networks emerged in the United States, but access remained restricted to the research community connected with the Department of Defense and other government agencies. This changed in 1986 with the creation of the NSFNet. Subsidized by the U.S. government, the idea of the NSFNet was to provide high-speed backbone services connecting regional networks as well as campuses and research centers. The network of networks communicating through the Internet protocol began to expand rapidly.

In the early 1990s, the management of the NSFNet backbone was subcontracted to private firms, which were allowed to route commercial traffic through the Internet. The explosive demand for network service in the 1990s—mainly from the private sector—led to the emergence of several commercial Internet backbone networks (such as Alternet, PSNet, and SprintLink), and in October 1995, the NSFNet backbone was shut down. U.S. government subsidies for the Internet have fallen to an insignificant amount, and almost all the costs of the Internet are now borne by its users.

Supporting the explosive growth of the Internet and of the demand for Internet services have been the rapidly evolving network architecture and user interfaces. This technology has benefited from the decline in computing costs relative to transmission costs. On the user side, the growth of the Internet has been promoted by the appearance of powerful programming languages, new network “tools,” and user-friendly interfaces. The World Wide Web, a sophisticated



Public Disclosure Authorized

Public Disclosure Authorized



application that allows users to access any kind of digitized information (text, picture, sound, video) and configure it for display with a mouse click, has given multimedia capabilities to the Internet. The growth of the Web has been astounding: between June 1993 and January 1997, the number of Websites leapt from 130 to roughly 200,000. Fostered by the improving multimedia capabilities, commercial use of the Internet overtook research and educational use and has been growing exponentially in the 1990s (see figure 1). By January 1997, there were close to 4 million hosts in the .com domain.¹ The private sector has clearly taken the driver's seat in providing both the Internet's infrastructure and its content in the United States.

Regulation

The Internet has blossomed in a relatively regulation-free environment. Most regulatory activity has concentrated on defining standards for the formats and protocols necessary to operate the network. But as the commercial presence on the Net increases, regulatory issues relating to the provision of the network's infrastructure and services become increasingly

important. The development of a regulatory framework is critical in three areas: provision of Internet backbone access; Internet service providers (ISPs); and information services.

The Internet backbone servers are the highest-level network servers—those to which ISPs pay connection charges. The basic regulatory options are to provide public support for backbone access to promote connectivity or to leave backbone service provision to the market. As mentioned, the original backbone in the United States, NSFNet, was government-funded until rapid growth in networking demand led to the emergence of commercial backbones. A similar pattern can be found in other industrial countries.

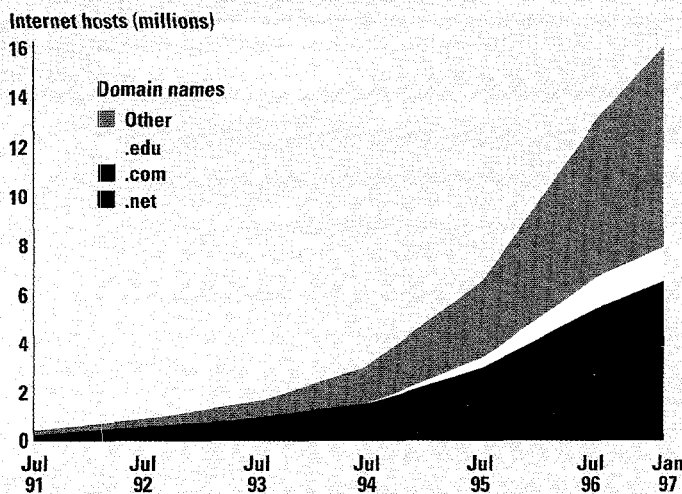
ISPs provide Internet services to the end users. In the United States, ISPs are competing private firms. In other countries, the major ISP is the state-owned telecommunications operator, often a monopoly. Regulatory options for ISPs depend on the market structure in telecommunications. In many cases, the telecommunications operators are well positioned to provide Internet services. But it is worth pointing out that OECD countries with more competitive telecommunications sectors tend to have greater Internet connectivity than countries with a monopoly.

Policymakers have to decide whether telecommunications network operators should be permitted to offer information services in direct competition with independent information service providers. As a rule of thumb, if a telecommunications operator has market power in the transport network, structural or at least accounting separation should be required to avoid anti-competitive cross-subsidization. In other words, the Internet services unit of the operator should be required to buy access to the transport network on an "arm's-length" basis. Another, very sensitive issue is voice telephony over the Internet, which may become a serious threat to the traditional circuit-switched network.

Appropriability of content

Digitized information can be easily reproduced and redistributed on the Internet, and providers of information find it difficult to charge users directly. Most private content providers recover costs indirectly: providing information to potential customers about other goods and services. But the conventional remedy for the cost

FIGURE 1 GROWTH OF THE INTERNET



Note: An Internet host is a computer that acts as an information and communications server and has a direct connection to the Internet. Top-level domain names identify hosts by type or origin—for example, .com (commercial), .edu (educational), and .net (network), the three most frequently used. Others include .org (organization), .gov (U.S. government), and country domains such as .uk (United Kingdom) and .de (Germany). But top-level domain names can be misleading: a host might not be located in the country indicated or might be either a public or a private institution. Source: Network Wizards (<http://www.nw.com>).

recovery problem is intellectual property rights protection. Copyright, for example, protects an author's work—whether a book, a performance, a recording, or a computer program—from unlicensed copying. In principle, traditional copyright law applies to the Internet environment. But such major industrial economies as the United States and those in the European Union have revised or are now revising their intellectual property rights laws to address specific needs of electronic networks. Moreover, the global character of the Internet demands international legal governance (box 1).

An important problem in legal protection for copyright holders on the Internet is enforcement, given the speed and magnitude of data transmission. This is an area where digital rights management technologies can be of help. In general, digital rights management technologies are hardware and software devices that control access to information and the ability to use and further distribute it. In principle, these “encryption” technologies are attractive because, unlike intellectual property rights, they can provide digital protection across national boundaries. Increasingly sophisticated digital rights management technologies are becoming available on the World Wide Web. But national security reasons have been invoked to limit the dissemination of cryptographic capabilities. The United States has been trying to address the national security issue by promoting data encryption standards that can be broken by intelligence agencies and by controlling the export of encryption technology, restrictive measures that may inhibit widespread commercial use of these technologies.

A third way to recover costs is through the sale of advertising space on information pages. Although this step toward pure commercial use of the Internet initially met with strong resistance from the research and education communities, growth has been rapid, and advertising revenues are estimated to have exceeded US\$250 million in 1996.

Internationalization

Although the Internet is still most dominant in the United States, the 1990s have been marked by its rapid internationalization. The share of non-U.S. hosts increased from 20 percent in July 1991 to 36 percent in July 1996. But most non-U.S. hosts still reside in industrial countries, and

BOX 1 INTELLECTUAL PROPERTY IN CYBERSPACE

The rise of the Internet gives new relevance to the issue of extra-territoriality and increases the demand for convergence among national intellectual property rights regimes. The Internet not only opens new possibilities for dissemination of information; it also expands the scope for activities that may infringe on someone's intellectual property rights. With a few keystrokes, an Internet user can download copyrighted material in bulletin boards around the world anonymously. Prosecuting Internet service providers can discourage infringement, but it may inhibit the expansion of the value added services that make the Internet so powerful.

The most important international treaty on copyright protection is the Berne Convention for the Protection of Literary and Artistic Works of 1886, which provides for national treatment of domestic and foreign copyright holders and sets minimum standards for copyright protection. The World Intellectual Property Organization (WIPO)—a specialized United Nations agency that administers the Berne Convention—held a diplomatic conference in December 1996 to revise the convention and to clarify the scope of copyright protection in the digital environment. The main outcome of this conference was the WIPO Copyright Treaty. This treaty makes clear that the reproduction rights of copyright owners encompass the right to make digital copies. But its language is broad enough to allow national legislation to limit (or remove) liability at the level of network providers with respect to, for example, temporary digital storage. The treaty thus achieves a balance between the concerns of content providers and those of content carriers.

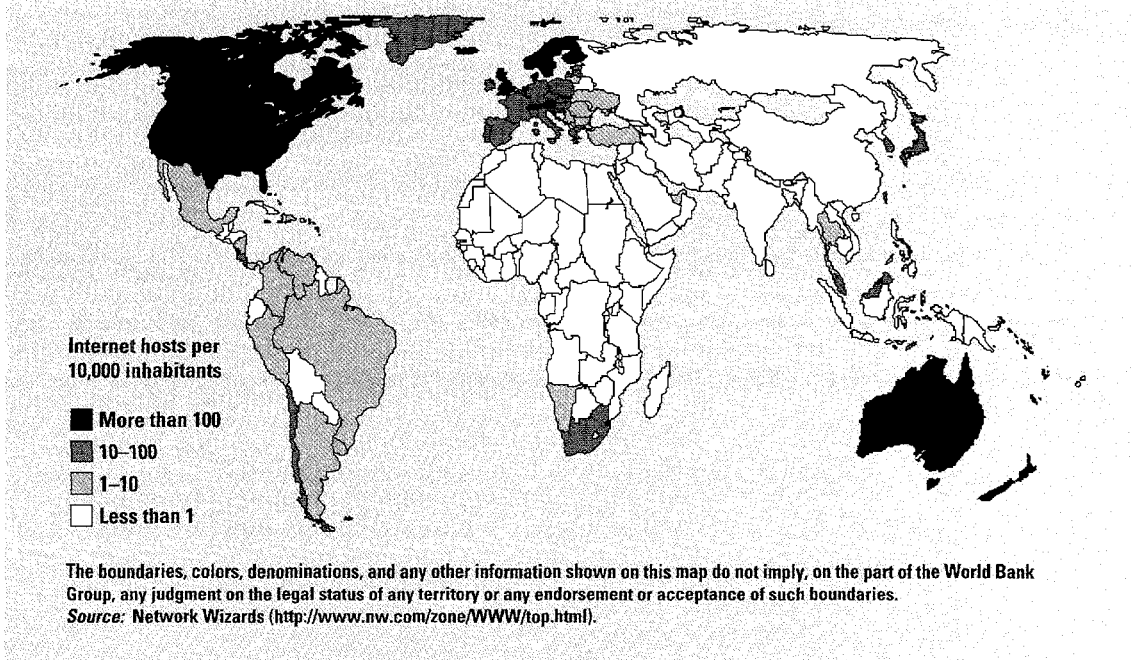
*Note: For further discussion of the economics of intellectual property rights in cyberspace, see C.A. Primo Braga and C. Fink, “The Economic Justification for the Grant of Intellectual Property Rights: Patterns of Convergence and Conflict,” in F. Abbot and D. Gerber, eds., *Public Policy and Global Technological Integration* (London: Kluwer, 1997).*

in July 1996, roughly 96 percent of all Internet hosts were in OECD countries. Most developing countries are connected to the Internet—if only through email—though penetration is still low (figure 3). In 1996, there was on average only 0.5 Internet host per 10,000 inhabitants in developing countries, compared with 101 in industrial countries. The low penetration is due mainly to the poor information infrastructure in developing countries. Average teledensity (telephone lines per person) is thirteen times lower, and average PC density thirty-eight times lower, than in industrial countries.

For developing countries, establishing the right regulatory environment is as critical as it is for industrial countries—though the relevance of the regulatory experience of industrial economies



FIGURE 2 GLOBAL INTERNET DENSITY, 1996



Viewpoint is an open forum intended to encourage dissemination of and debate on ideas, innovations, and best practices for expanding the private sector. The views published are those of the authors and should not be attributed to the World Bank or any of its affiliated organizations. Nor do any of the conclusions represent official policy of the World Bank or of its Executive Directors or the countries they represent.

To order additional copies please call 202-458-1111 or contact Suzanne Smith, editor, Room G8105, The World Bank, 1818 H Street, NW, Washington, D.C. 20433, or Internet address ssmith7@worldbank.org. The series is also available on-line (www.worldbank.org/html/tpd/notes/notelist.html).

♻️ Printed on recycled paper.

discussed above is open to debate for countries with poor telecommunications networks, low computer penetration, and inefficient, state-owned telecommunications monopolies. But a few developing countries have managed to rapidly expand Internet connectivity despite weak information infrastructure, such as Brazil, Chile, the Czech Republic, Mexico, Malaysia, and South Africa. Brazil, for example, successfully adopted a model of public-private partnership to diffuse the Internet, and it has increased Internet connectivity notwithstanding its dominant state-owned telecommunications operator. The Brazilian government supports an Internet backbone open to commercial connectivity and traffic while limiting the dominant carrier's activity in the direct provision of Internet services to the public. The number of Internet hosts in Brazil (.br domain) grew from 300 in January 1992 to more than 50,000 in July 1996, of which some 20,000 are commercial (.com.br domain). By the mid-1990s, Brazil had a higher ratio of Internet hosts to PCs than such economies as France, Germany, Hong Kong, and Singapore.

There are, of course, many obstacles to the diffusion of the Internet in developing countries. National laws regarding privacy and intellectual property rights protection must be refined. And

the predominance of English-language content may deter local researchers or local firms that could use the Internet to add value to their goods and services. The critical bottleneck, however, continues to be the weak information infrastructure of developing countries. Government activism to promote Internet connectivity at the level of the research and education communities may help jump-start the national information infrastructure. And governments should support community access in public libraries and community centers. But an increasingly important role for governments in fostering the Internet revolution is that in the regulatory arena. Most important here is to promote a competitive environment for Internet service providers, establish adequate rules of the game for electronic commerce, and ensure effective incentives for the provision of content—essential measures for attracting private investment in the infrastructure and in content generation.

¹ This understates the number of commercial hosts, since the .net domain (with more than 1.5 million hosts) and some of the country domains also include commercial hosts.

Carlos A. Primo Braga (cbraga@worldbank.org), Principal Economist, and Carsten Fink, Consultant, Telecommunications and Informatics Division