U.S. Telecommunications Services in European Markets

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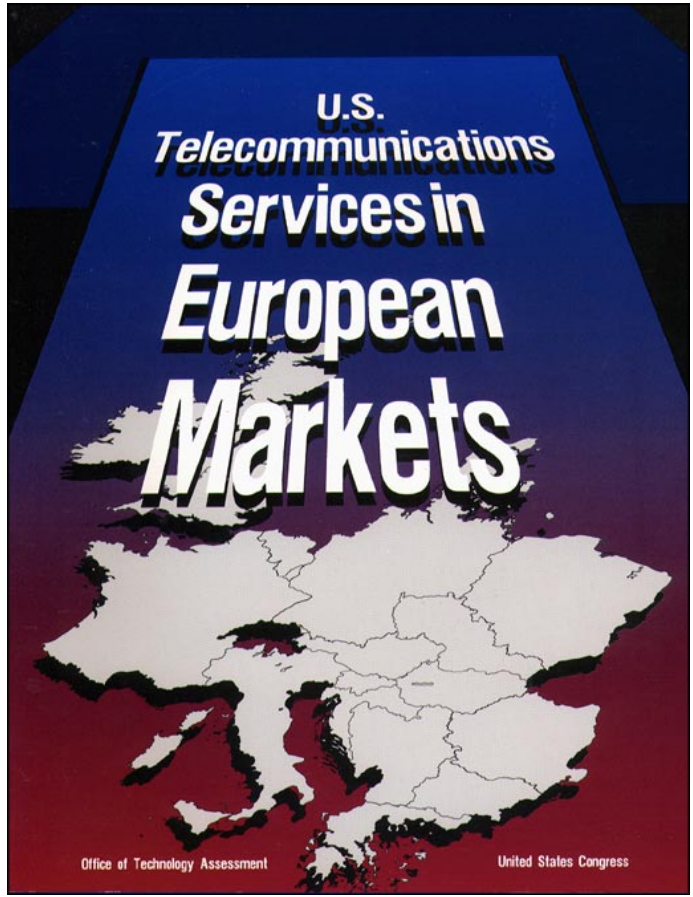

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Foreword

The European market for telecommunications services will grow rapidly over the next decade, fueled by demand from the European business community for fast data transmission and other advanced services.

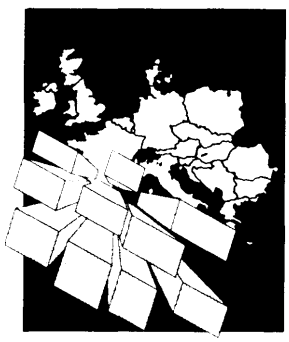
THE EUROPEAN MARKET FOR TELECOMMUNICATIONS SERVICES will grow rapidly over the next decade, fueled by demand from the European business community for fast data transmission and other advanced services. In most European countries, the telecommunications services market is still largely reserved for a state-owned Public Telephone Operator, but this is likely to change in the near future. Meanwhile, U.S. telecommunications firms-including regulated carriers-are successfully competing in some European markets already open to them, especially in cellular communications and cable television. U.S. firms appear to have an edge in these markets because of their experience operating in competitive markets and developing innovative services based on advanced network technology and in response to changing user needs.

The U.S. economy can benefit both by increased export of telecommunications and related services to overseas markets, and by the support that U.S. networks provide to other U.S. firms operating in global markets. Success in international trade in services can, and already does in part, offset our troublesome deficit in trade in merchandise. U.S. telecommunications firms are eager to pursue opportunities in foreign markets, and no government interventions appear to be necessary, other than continuing to press our European trading partners to open markets to U.S. competition. Beckoning success in European telecommunications markets does, however, raise some domestic policy concerns, including the role that trade objectives should play in fomlulating telecommunications policy.

This study of U.S. participation in European telecommunications markets was requested by the Senate Committee on Finance and the House Committee on Foreign Affairs, A Background Paper, *[1. S. Bunks and International Networks,* prepared in the course of this assessment was released separately in October 1992.

Roger C, Herdman
Director

Advisory panel



NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve. disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

John Diebold, *Chairman*
Diebold Institute for
Public Policy Studies, Inc.

James R. Beniger
Professor
Annenberg School of Communications
University of Southern California

Mark L. Bigelow
Network Architect, Information Services
Bechtel Corporation

Robert Bruce
Partner
Debevoise & Plimpton

Emilio DeLia
Department Director
International Communications Services
AT&T

Steven Flajser
Vice President for Space Systems
LORAL

Kenneth Gordon
Chief Commissioner
Massachusetts Department of
Public Telecommunications

Bruce Greenwald
Professor
Department of Economics
Columbia University School of Business

J. Donald Karmizin
Vice President
Management Infomation Systems
United Airlines

Gene Kimmelman
Consumer Federation of America

Michael Nugent
Vice President and
Associate General Counsel
Citibank, NA

Barbara O'Connor
Professor/Chairperson
Alliance for Public Technology
California State University
Department of Communications

Reynie U. Ortiz
Vice President for Public Policy
U.S. West

Frances Plude
Professor
Communications Department
John Carroll University

Michael J. Reilly, Sr.
Vice President for External Relations
Reuters America, Inc.

Tony Rutkowski
Director of Technology Assessment
SPRINT

Marie-Monique Steckel
President
France Telecom, Inc.

Reviewers and contributors

see Appendix A, pages 203-210.

Project staff

PRINCIPAL STAFF

Vary Coates, *Project Director*

Todd LaPorte, *Analyst*

Mark Young, *Research Analyst*

OTA MANAGEMENT

John Andel in, *Assistant Director, OTA*
Science, Information, and Natural Resources Division

James W. Curlin, *Program Manager*
Telecommunication and Computing Technologies Program

ADMINISTRATIVE

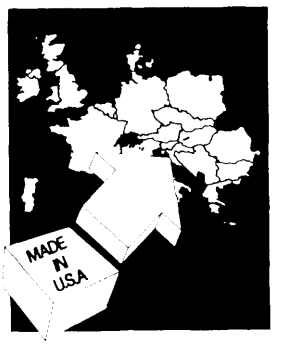
Liz Emanuel, Office Adminisstrator
Michelle Smith, *Secretary*
Karolyn St. Clair, PC Specialist

CONTRACTORS

Bruce Egan,
Columbia Business School
Louis Feldner,
Feldner Telecom Consulting
Rob Frieden, Telecommunication Consultant and Attorney
Dale Hatfield,
Hatfield Associates
Manley Irwin,
University of New Hampshire
Gligor Tashkovich, Consultant,
International Telecommunications
Deborah Workman, Consultant

OTA ADVISORY GROUP

Peter Blair.
Energy and Materials Program
Sylvester Boyd, Telecommunication and Information Systems
Linda Garcia, Telecommunication and Computing Technologies Program
Julie Gorte, industry, Technology, and Employment Program
William Keller, Industry, Technology, and Employment Program
Bill Westermeyer, Oceans and Environment Program
Robert Weissler, Industry, Technology, and Employment Program
Ray Williamson, International Security and Commerce Program
David Wyc. Telecommunication and Computing Technologies Program



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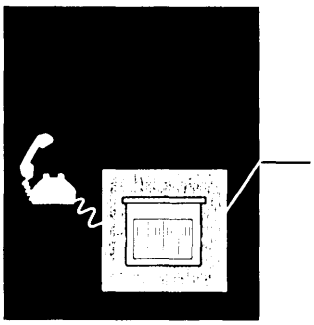


Exporting Telecommunications Services to Europe

CHAPTER 1

The entry of U.S. telecormmmications firms into European services markets is-at this ear/y stage-a striking success story.

U.S. TELECOMMUNICATIONS FIRMS are sending a message to Europe—' 'we intend to offer services to Europe's under-served telecommunications users, ' They are watchfully assessing European progress toward liberalization of national markets and integration into a single European market. Meanwhile, U.S. carriers and enhanced-services providers[1] are entering the niche markets that are open to them, such as cellular communications and cable television.

The entry into European markets for services by American telecommunications firms, from major carriers to small niche-services providcrs, is—at this early stage—a striking success story. Growing U.S. export of telecommunications and related information services[2] in the future can contribute significantly to national economic goals. Further expansion appears to require little or no government intervention—in this area, deregulation and pursuit of free trade has worked well.

However, there are some major caveats to these conclusions:

- Emerging technological and institutional trends could adversely affect bilateral and multilateral trade agreements already negotiated or being pursued by **U.S. trade** representatives, making them eithcr unstable or overly restrictive.
- U.S. international telecommunications policy is being defined almost singlehandedly by the Office of the United States Trade Representative (USTR). The industry structure, regulatory environment, and investment strategies that are conducive to free trade and encouraged by the USTR may not be equally appropriate for meeting the broaderrange of national telecommunications objectives.
- Inadequate investment in domestic telecommunications infrastructure could result from continuing investment overseas by regulated U.S. telecommunications operators, according to some State regulators and public interest groups. (The Office of Technology Assessment finds eviidence for this inconclusive, but concludes that investment trends should be monitored.)

This report rests on the premise that telecommunications is not just a set of tradable services, but also a basic function of society, essential for effective governance social cohesion, and economic viability' and equity. International telecommunications is a primary vehicle for U.S. participation in the global polity, as well as the global market - place. Public policy interest in international telecommunciations therefore goes beyond the question of competitiveness in foreign markets.

This chapter summarizes findings from the analysis presented in more detail in the follow in: eight chapters. It addresses several questions:

[1] The terms "enhanced" or "value-added" services indicate services that go beyond the transmission of voice or data (i. e., "basic services") to provide collection, selection, formatting, processing, or selective delivery of material being communicated. An enhanced-servicesprovider may be a carrier or network operator, but more often provides services over lines leased from a carrier.

[2] For the sake of simplicity, this report will sometimes include two quite different phenomena under the shorthand phrase "export of services": namely, the direct delivery of services from the United States toot her countries over electronic networks (e.g., cash management services or market data analysis), and the dell very of services through subsidiaries orjoint venture corporations overseas. At other places in the report, as appropriate to analysis, these two phenomena will be clearly and explicitly distinguished.

Growing U.S. export of telecommunications and related services can contribute to U.S. economic goals.

CAN U.S. FIRMS GAIN WIDER ACCESS TO EUROPEAN MARKETS FOR TELECOMMUNICATIONS AND RELATED SERVICES?

Technological and political trends, especially the likely effects of the European Community's Open Network Provision Directive, are converging to bring about wider access to European telecommunications markets. For U.S. firms, nearly 85 percent of the potential market is now closed. Continuing pressure from the U.S. Government through USTR may somewhat hasten broader market access. However, U.S. telecommunications firms caution that such pressure should not result in opening U.S. markets to entry of foreign telecommunications operators whose home markets still exclude U.S. services providers.

CAN U.S. FIRMS SUCCESSFULLY COMPETE IN THE EUROPEAN MARKETS?

U.S. services providers can be strong competitors in European telecommunications markets. Technology and deregulation have allowed them to develop innovative services attuned to the changing needs of business users. European business users now are relatively poorly served by the public telephone operators (PTOs).[3] U.S. firms, including major long-distance carriers and regional Bell holding companies (RBHCs) have already invested billions of dollars in Europe and are doing well in niche markets.

IS IT IN THE PUBLIC INTEREST TO ENCOURAGE PARTICIPATION OF U.S. TELECOMMUNICATIONS FIRMS IN OVERSEAS MARKETS, ESPECIALLY THOSE FIRMS THAT ENJOY REGULATED MONOPOLY STATUS IN THEIR HOME REGIONS--I.E., THE REGIONAL BELL HOLDING COMPANIES?

Expansion into European markets by U.S. telecommunications firms can contribute significantly to maintaining a positive trade balance in services, both directly and by supporting the competitive activities of other U.S. services providers, ranging from airlines to wholesale merchants, in European markets. It may also encourage the European sales of U.S. telecommunications equipment and other information technology. For political reasons most of this economic activity is in the form of joint ventures and similar kinds of direct overseas investment, which has given rise to fears that this will compete with capital for domestic investment in infrastructure modernization and in research. There is so far no clear evidence of such harmful effects, but investment patterns should be monitored to detect any emerging adverse effects so that corrective measures can be taken if appropriate.

WHAT CAN THE U.S. GOVERNMENT, AND ESPECIALLY THE U.S. CONGRESS, DO TO ENCOURAGE BROADER MARKET ACCESS AND TO ENHANCE THE COMPETITIVENESS OF U.S. TELECOMMUNICATIONS FIRMS OVERSEAS?

Broader market access may come about more as a result of pressure from users and actions by the Commission of the European Community (EC), than as a result of trade negotiations. However, the U.S. Government should continue to press, through bilateral and multilateral trade negotiations, for further liberalization of European telecommunications markets and wider access to

[3] The state telecommunications authorities were traditionally called PTTs, for Postal, Telephone and Telegraph administrations, and were generally part of a government ministry. In most cas telephone/telegraph functions have been separated from postal functions and operating responsibility y has been divorced from regulating responsibility, so that the older designation is no longer always appropriate.

those markets for U.S. firms. Caution is ww-ranted, because negotiating positions developed by the Office of the U.S. Trade Representative may be undermined by technological trends that challenge distinctions between basic and enhanced services and between public and private networks.

Beyond this, there is little that the U.S. Government needs to do or should do, at this time, to improve the competitiveness of U.S. carriers and services providers overseas. There is little evidence that the domestic restrictions imposed on carriers at divestiturc (however onerous or effective they maybe at home) now arc a significant factor in success in European ventures.

IS THE POLICYMAKING STRUCTURE FOR INTERNATIONAL TELECOMMUNICATIONS NETWORKS ADEQUATE AND APPROPRIATE FOR THE COMING DECADE?

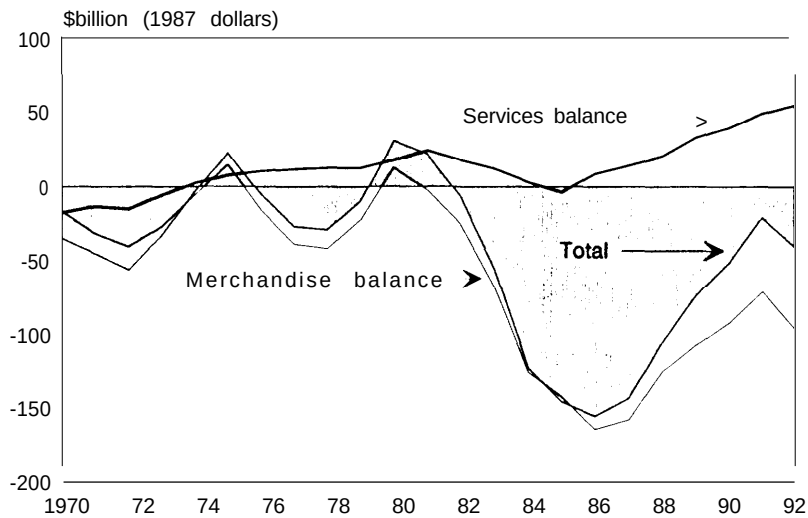
U.S. policy for international telecommunications has for the last 5 years been largely determined by USTR. This is cause for concern. The unidimensional focus of USTR on forcing open world markets for services may slight or diminish other public policy goals related to telecommunications, such as strengthening the domestic telecommunications infrastructure, extending the scope of universal service, or assuring the interoperability of networks. The mechanisms for coordinating policy formulation and regulatory actions have become ineffective and need to be strengthened.

This chapter summarizes these and other findings discussed more fully in later chapters, It then suggests some actions that Congress may consider for monitoring the long-term, indirect effects of overseas activities of U.S. carriers, and for strengthening the policy development and implementation process for international telecom - munications.

Summary of findings

THE EUROPEAN MARKET FOR BASIC AND ENHANCED TELECOMMUNICATIONS SERVICES WILL EXPAND STRONGLY OVER THE NEXT FIVE TO TEN YEARS.

Comparison of the consumption of telecommunications services in Europe and the United States indicates that in all European countries there is a substantial unsatisfied demand for business-oriented telccommunications services. Monopoly control of networks and services, high tariffs, and strict constraints on the development of private networks have kept this demand from being met.



SOURCE U.S DEPARTMENT OF COMMERCE, 1993

Figure 1-1.
U.S. Trade Balance,
1970-92

The Commission of the European Community is pushing ahead with its effort to create a single European market; it puts high priority on the integration of telecommunications networks and deregulation of value-

Box I-A. Restrictions on Access to the U.S. Market for Foreign Telecommunications Companies

Although the U.S. telecommunications services market is relatively open compared with that of most other countries, there are some restrictions on entry of foreign firms. These are:

- Section 310 of the 1934 Communications Act (47 U.S.C. 31 O) prohibits foreign companies from

  —holding common carrier radio licenses,
  -owning more than 20 percent of U.S. companies that hold such licenses, or
  —having any representation on the board of a U.S. radio license holder.

  Foreign citizens may not be officers of a U.S. company holding a radio license. When foreign investment in a common carrier is indirect, i.e., through a subsidiary, Section 31 O(b)(4) allows 25 percent foreign stock ownership, foreign directors, and foreign officers. It also gives the Federal Communication Commission (FCC) discretion in waiving these limits. The FCC has never done so.

  This provision was originally aimed at preventing foreign powers from gaining control of U.S. broadcasting, which might be used for propaganda. With the advent of microwave transmission for long-distance telephony, a result of this provision was to keep foreign firms out of long-distance telephone service as well. As telecommunications carriers continue a shift from microwave to fiber optic cables, Section 310 will pose less difficulty for foreign firms. There are also ways around Section 310, such as assignment of radio licenses to third parties.

- The Submarine Cable Landing Act (47 U.S.C. 34-39, especially Section 35) prohibits foreign companies from landing cables in t he United States without permission from the FCC. One of the purposes of this act was to give the United States leverage in getting U.S. cables landed in other countries.
- The Telegraph Act (47 U.S.C. 17) forbids foreign companies from landing telegraph lines or cables in Alaska.
- The Communications Satellite Act of 1962 (47 U.S.C. 701-757) established COMSAT as the sole U.S. participant in the INTELSAT consortium, thereby limiting foreign carriers'

added services. In spite of stubborn political resistance, the liberalization of the 12 European national markets is underway. In most of these countries, the responsibility for operating telecommunications networks has been separated from telecommunications regulatory authority and placed in a free-standing (but usually state-owned) corporation. Competition is allowed in some or most value-added services. Progress toward liberal - ization and curtailment of state monopolies is likely to pick up speed because of pressure on European governments from three sources: large business users, the EC Commission, and other participants in the Uruguay Round of the General Agreement on Trade and Tariffs (GAIT).

The European Community's drive to a single market promises to expand the geographical scale of many European corporations, increasing their need for translational services. If the single market succeeds in bringing about strong European economic growth, the demand for basic and enhanced

access to satellite transmission capabilities in the United States. ' Satellite transmission requires radio licenses under Section 310, noted above. Private satellite systems used for common carrier purposes are subject the Section 310 restrictions.

- The FCC Decision, *International Competive* Carrier (102 FCC 2d 812 (1 985), as modified in *F?egu/alien of International Common Carrier Services* (CC Docket No. 91-360, FCC 92-463 as released Nov. 6, 1992) stipulates that a firm with 15 percent foreign ownership, or which has a foreign representative on its Board of Directors, be considered a "dominant carrier" in the United States for purposes of regulation, and therefore be required to register its proposed tariffs and costs with the FCC before offering its service to the public, and be further required to file quarterly traffic and revenue reports with the FCC.[2] Some foreign telecommunications operators complain that the FCC has delayed action on applications for over a year. Private line services are not affected by this order.
- The Exon-Florio Amendment to the Defense Production Act of 1950 (50 App. U.S.C. 21 70) provides that the U.S. Government may review and prohibit foreign acquisions, mergers, or takeovers of corporations that could adversely affect U.S. security interests. This provision has not yet been invoked in the telecommunications field.

  Note: While no mainland U.S. local telephone company has been acquired by a foreign firm, an 80 percent interest in Puerto Rico Telephone Co. has been acquired by Telefonica of Spain. The Section 310 radio license issue was dealt with by Puerto Rico Telephone Co. ceding its licenses to a third party.

The opportunity to bypass public networks will force open the markets now closed to competition.

1 An FCC ruling on a petition from Reuters stated that the term "satellite terminal station" in the act meant Earth stations connected to a terrestrial communications network, but this left the scope of the act unclear to many foreign firms.

2 S$_{\text{ction}}$ 214 of the Communications Act of 1934 requires that the establishment of circuits between the United States and other countries, or between the states of the United States, is subject to government approval The U.S. dom inant earners, AT&T and COMSAT, are obliged to file their proposed tariffs 45 days in advance, with cost justification. Nondominant earners, such as MCI and Sprint, have a streamlined requirement-14 days notice, with no cost justification necessary.

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT 1993

telecommunications services will further intensify. Thus European markets for telecommunications services are attractive future targets for exported telecommunications services and related information services.

ACCESS TO EUROPEAN MARKETS FOR U.S. TELECOMMUNICATIONS FIRMS WILL NOW BROADEN RAPIDLY.

As much as 85 percent of the aggregate European telecommunications market remains closed to U.S. firms chiefly because it is closed to even domestic competition. *(In* the United States, the local exchange market for voice services is also closed to foreign competition.) (See box 1 -A.) Basic voice and data transmission is reserved to state-owned monopolies (the PTO) in all European countries except the United Kingdom.

Access to this reserved portion of the market will almost certainly soon be forced opened by the same kind of competitive pressure that brought about U. S. deregulation and divestiture of AT&T—namely, the

ability of large corporations to bypass the public switched networks by developing private networks. The EC Open Network Provision Directive, issued in 1992, requires each member-state to make leased lines available to customers with no restraints on their use or on interconnection to the public switched networks. This effectively opens the door for bypass—i.e., for the use of private networks to deliver both voice and data traffic in competition with the public networks. As corporations rush to develop private networks in order to get cheaper, customized basic services, they will also want to attach equipment of their own choosing, and they will actively seek enhanced or value-added services customized to meet their corporate needs. Thus broadened market access in the future may have less to do with trade negotiations than with technological and market imperatives.

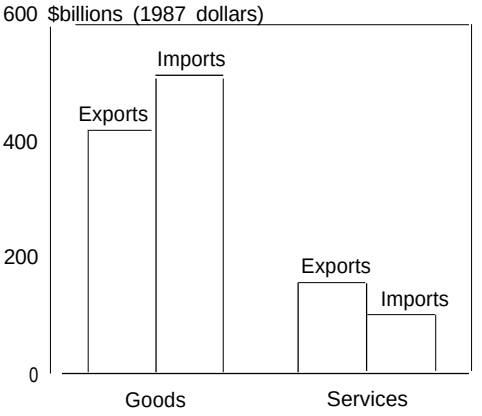


Figure 1-2. U.S. International Transactions, 1992

SOURCE U.S DEPARTMENT OF COMMERCE, 1993.

U.S. TELECOMMUNICATIONS FIRMS ARE MAKING A STRONG ENTRANCE INTO EUROPEAN NICHE MARKETS, PREDOMINANTLY BY DIRECT INVESTMENT ABROAD.

U.S. firms are already entering European niche markets for enhanced or value-added services, largely through partnering with European firms, often the monopoly PTOs. A U.S. carrier can handle a global corporation's needs only so long as one end of the traffic either originates or terminates in the United States. Partners are necessary both to share capital and to provide national regulatory standing and customer access in many countries.

The three major U.S. long-distance carriers (AT&T, MCI, Sprint) are actively pursuing European partners for consortia to provide large multinational corporations with a full range of services (' 'one-stop shopping' on a global basis. AT&T hopes to earn 50 percent of its total revenues overseas by **2000.**

The seven regional Bell holding companies are estimated to have invested about$12 billion overseas. RBHCs pursue three kinds of European activities. They are constructing and operating cellular networks, building on their solid expertise gained at home, both to compete with monopoly local carriers in Western Europe and to provide an alternative to wire infrastructure in Central and Eastern Europe. They are experimenting with and gaining experience in other kinds of infrastructure-Personal Communications Networks and, especially in the United Kingdom, cable television networks—hoping to bring this experience and expertise home when there is a change in U.S. regulations. They are also investing in privatized foreign PTOs, although these investments have mostly been in non-European countries that have greater need for infusion of foreign capital than do European countries.

Economists have assumed that most services must be produced where they are

delivered. Many telecommunications and information services, however, could be delivered electronically, directly from the United States through international networks. But even with liberalization and market integration, European countries will try to arrange matters so that both national laws and EC regulations continue to favor European firms. The primary purpose of European market integration is to increase the competitiveness of European industries vis-a-vis American and Japanese firms that have benefited from larger domestic markets and larger scale operations.[4] The benefits of transborder access and free movement of goods will, however, accrue also to foreign firms that have established a legal presence in member-states; in theory, they will be considered European firms. For this reason, many U.S. services vendors will continue to operate through European subsidiaries or joint ventures.

THE COMPETITIVE EDGE OF U.S. FIRMS IN BASIC NETWORK SERVICES AND ENHANCED SERVICE> BOTH IN TECHNOLOGY AND IN MANAGERIAL EXPERIENCE—IS WIDELY RECOGNIZED.

U.S. services exporters to Europe, heavily dependent on international telecommunications networks, agree that they are well served by U.S. carriers. (See chapter 5.) American communications and computer technology, they say, gives them a competitive edge in foreign markets by enabling them to offer innovative services. Network technologies and services are especially important to providers of transportation. freight, and travel-related services, which constitute about 58 percent of all U.S. services exports, and to financial services and data processing services, which add another 5 percent.

By comparison, American firms operating in Europe feel seriously hampered by the necessity of relying on European technology and services for communications within Europe and at the European end of international networks. Many of them complain of the scarcity of high-grade leased lines, restrictions on the use of all leased lines, lack of access to fast data networks, severe restrictions on-or delays in—approving customer-premise equipment, irregular and inconsistent billings, and above all, excessively high costs. These problems beset European users as well. If U.S. telecommunications firms are allowed broader access to the market they may be able to capitalize on these opportunities to prove greater efficiency and greater responsiveness to users' needs.

EUROPEAN OPPORTUNITIES, NOT U.S. REGULATORY RESTRICTIONS, NOW DRIVE U.S. PARTICIPATION IN EUROPEAN MARKETS.

U.S. telecommunications firms have concluded that their future growth may depend largely on foreign markets, where growth rates are expected to be much higher than in the now better-served U.S. markets. For example, European consumer expenditures for telecommunications (now much lower than those in the United States) are projected t. grow three times faster in the next few years. Estimates of annual growth rates for business-oriented enhanced services range

U.S. carriers know how to provide innovative services wanted by both European and American corporate users.

[4] Japanese firms have not been significant competitors in the European market for telecommunications services (as distinguished from telecommunications equipment). Japan has not permitted the Nippon Telegraph and Telephone Co. to operate overseas.

from 20 to 30 percent per year (see chapter 3 for detailed market projections).

U.S. Federal and state regulations—especially the Modified Final Judgment (MFJ) that has governed the activities of RBHCs and their regional Bell operating companies (RBOCs) since their divestiture from AT&T—limit the range of opportunities for new services and new sources of revenue in the United States. The MFJ prevented RBOCs from engaging in information services, long-distance transmission, and equipment manufacturing in the United States. The prohibition on offering information services has now been lifted, and legislation is pending that would allow telecommunications companies to own and operate cable television companies.[5]

Just after divestiture, being forbidden by the MFJ to invest in many domestic telecommunications-related areas, RBHCs made widely diversified investments beyond their line of business, including, for example, real estate development. The poor performance of these noncornmunications investments strongly encouraged RBHCs to look abroad for expansion, divcrsification, and investment activities that would better match their corporate experience and competence.

Now, however, it is likely that their European initiatives arc pulled by opportunities abroad more strongly than they arc pushed by regulatory limitations at home. U.S. telecommunications firms would probably not pull back from overseas ventures if MFJ restrictions were ended, as long as opportunities in foreign markets remain inviting and there is hope of wider market access. Although some industry spokesmen continue to bring up the issue of overseas investment as a reason to end all remaining MFJ restrictions (indirectly implying that these discourage them from investment in the United States), it is unlikely that resolution of this domestic policy issue, one way or the other, would in itself have a decisive impact on the rate of overseas investment. On the other hand, the experience RBHCs arc gaining overseas is likcly to affect what new enterprises they pursue at home, when and if regulatory restrictions arc lifted.

Just as RBHCs use their overseas investments as an argument for lifting MFJ restrictions on domestic activities, they also argue that U.S. antitrust laws should be softened because they prevent RBHCs from joining together to respond to European competitive contract bids. It is not clear that this is true. U.S. Department of Justice rulings regarding antitrust arc not generally considered exportable, and no effort has been made by the government to prevent RBHCs from partnering with each other outside the United States. Two RBOCs have in fact done so in New Zealand, and other examples have occurred. Corporate lawyers arc cautious in interpreting antitrust law, since judicial challenges are expensive. It is likely, however, that more important considerations are the perceived value of a European partner and the perceived risk of sharing information and technology with another RBHC.

Some telecom firms argue that they arc at a competitive disadvantage vis-a-vis Euro-

[5]RBOCs can still not provide regional information services because the prohibition on long-distance transmission—including signaling—would force them to set up special transmission equipment and data banks in each local area rather than centralizing them, as efficient service would require.

pean firms because of the high cost in the United States of capital and because foreign governments often subsidize low-cost capital for overseas expansion. However, there is little evidence that any governmental financing support is needed. Most overseas telecommunications investments are funded from retained earnings and the U.S. carriers are generally cash-rich.

FOREIGN INVESTMENTS BY U.S. CARRIERS, ESPECIALLY RBOCS, WHICH ARE REGULATED LOCAL MONOPOLIES, MAY INVOLVE SOME RISKS TO U.S. CONSUMERS.

Domestic investments by RBHCs soon after divestiture, in fields unrelated to the firms' core business, were often unsuccessful. By contrast, recent overseas investments reflect focused corporate strategies that fit their proven expertise and may have a much better chance of success. The potential costs or risks of overseas competition have, however, not been satisfactorily addressed. Some state regulators and public interest group representatives fear that foreign investment diverts funds that would otherwise go to investment in domestic infrastructure modernization and development of innovative services. Some also fear that business losses or lack of adequate return on investment overseas could lead to rising consumer prices at home, or could by weakening the viability of the regional holding companies undermine the stability of their regulated local subsidiaries.

The idea that a firm's overseas investments might contribute to declining investment or disinvestment at home is based on the assumption that since companies must allocate scarce resources among competing interests, a pool of investment capital (such as the BOCs' retained earnings) would be spread more thinly in an organization with many establishments than in one with few. In addition, if some of those establishments operate in faster growing markets or less restrictive regulatory environments, a parent company may invest more in the enterprises located in these favorable environments. These are legitimate concerns, although as discussed above, in high-tech enterprises the failure to operate in global markets could be a brake on efficiency and innovation.

Could overseas investment mean a decline in domestic investment? Close attention is warranted.

These concerns have only recently begun to be voiced, and state regulators are moving slowly to assess the risks. Only state regulators now have an obvious brake on the extent of overseas investment by RBHCs, through their regulation of tariffs and depreciation rates and hence the ability to limit the amount of retained earnings available for investment—the major source of investment financing. (See chapter 9.)

The evidence as to whether domestic investment is declining is mixed and inconclusive. The value of U.S. carriers' current plant grew little in the 1980s (when inflation is taken into account), and the value of annual construction appears to have decreased strik-

Network interoperability is essential to both users and providers of international services.

ingly between 1980 and 1990.[6] However, technology costs also declined significantly during this period, and network architecture changed in ways that affect the distribution of investment. Expenditure for research and development—by long-distance carriers, by RBHCs, and by telecommunications equipment manufacturers-is far lower than that of European counterparts. This is a significant concern, but R&D investment, although low, cannot be conclusively shown to have declined since divestiture in 1984 or in the period of high foreign investment beginning about 1988. (See chapter 9.)

Available time-series data are inadequate for making conclusive statements about either a continuing decline in investment or causal relationships between high foreign investment and low domestic investment. This issue is potentially very important. Investment trends, both in infrastructure and in research and development, should be carefully monitored by state regulators, the FCC, and congressional committees.[7]

INTERNATIONAL CARRIERS AND USERS HAVE DIFFERENTPERSPECTIVES ON COMPETITIVENESS AND TRADE POLICY ISSUES.

Accustomed to the expansive domestic market and relatively homogeneous regulatory environment in the United States, American telecommunications users operating businesses in Europe resent the multitude of disparate prices and billing procedures and the conflicting rules and regulations over relatively short distances. As discussed in chapter 5, they often are even more eager for liberalization of telecommunications markets within Europe than they are for the end of remaining restrictions on market entry of U.S. providers.

U.S. carriers want broader access to European markets, but they fear that they could be hurt by multilateral trade negotiations that result in the loss of some restrictions on foreign telecommunications firms entering the U.S. market, without assuring the full dismantling of foreign state telecommunications monopolies that exclude them from much of the European market. Some believe that they might fare better under bilateral than multilateral negotiations. However, since each European country is a much smaller market than the United States, most would prefer a multilateral agreement.

The interests of providers and users also diverge with regard to network interconnection and telecommunications standards. (See chapter 2.) Both carriers and users give lip service to the ideals of global interoperability and international standards. However, telecommunications companies have strong

[6] According to the U.S. Telephone Association, t he value of U.S. carriers' current plant grew only 3 percent from 1980 to 1989 (in 1980 dollars). From 1981 to 1989, there was shrinkage or no growth in value (i.e., an increase of 1 percent or less) in 5 of the 9 years. The value of annual construction, in 1980 dollars, decreased 40 percent from 1980 ($21.2 billion) to 1989 ($12.6 billion). In 8 of the 9 years following 1980, construction declined from the previous year or was stable in value (increasing 1 percent or less). FCC figures, for reporting carriers only, indicate that from 1985 to 1989, the value of gross plant grew by 6 percent (in constant dollars) but it did not increase from 1987 through 1989. Each year from 1986 through 1989, the value of annual construction declined from 2 to 10 percent over the preceding year (from S1 5.1 billion in 1985 to $12.3 billion in 1980 dollars). Annual revenues also declined by 3 percent in constant dollars from 1985 to 1989.

[7] This will not be possible without requiring some standardized reporting of data by the industry, but the paperwork burden would be very light since the data is well known to the corporations.

reservations about traditional international standards-setting bodies and procedures, and tend to cling to proprietary protocols and the use of specializcd interconnection technology to achieve interoperability. Users, however, generally want international standards that will give them broad choice in using and combining networks, customer-end equipment, and services from a variety of vendors.

The emphasis now being given by the European Community to the development of communitywidc telecommunications standards may put U.S. telecommunications firms at a disadvantage both in gaining full access to an integrated European market, and in influencing international standards development. Some ad hoc, specialized standards consortia are successfully pulling together manufacturers, services providers, and users to develop and implement standards in a reasonable time frame, but many tensions remain in the cumbersome U.S. standards-setting process.[8]

Interoperability is essential to both users and providers, and while it can be achieved by alternative strategies, the United States cannot by itself dictate either the path to achievement, nor the architecture that eventually determines interoperability. More leadership by the U.S. Government may, however be necessary to assure this interoperability,

U.S. INTERNATIONAL TELECOMMUNICATIONS POLICY HAS BEEN THOROUGHLY SUBORDINATED TO TRADE POLICY. ACCESS TO FOREIGN MARKETS IS NOW THE ONLY CLEARLY ARTICULATED GOAL.

U.S. trade policy is focused tightly on free trade and open markets. The United States initiated and consistently pushed for recognition of services as tradable entities, for which terms of trade could be embodied in bilateral and multilateral treaties and should eventually be included in the framework of the international General Agreement on Trade and Tariffs. In the current Uruguay Round of GATT negotiations, a "Telecommunications Annex' has been tentatively agreed on, pending acceptance of an overall trade agreement (which may now be receding into the distance). The annex sets out the rights of users and services providers to network access, interconnect ion, and transparency of terms and tariffs.

The U.S. negotiating position for the Uruguay Round and its Telecommunications Annex was worked out by USTR in consultation with Federal agencies and representatives of carriers, corporate telecommunications users, and labor groups. Because the responsibility, and therefore the constituency, of USTR is very broad, cutting across all industry sectors, it is a hospitable forum for large corporate users of telecommunications and is especially attentive to their concerns. Corporate users reinforce USTR's focus on unfettered access to services and unlimited network interconnection, but are concerned that USTR may not have pushed vigorously enough for open markets in Europe. US. telecommunications firms are concerned about the degree to which the domestic telecommunications market may be "locked open" to EC firms by GATT, while the EC nations continue to protect their national monopoly carriers by reserving large segments of the telecommunications market to them. (The GATT principle of

[8]U.S. Congress, Office of Technology Assessment, *Global Standards: Building Blocks for the Future*, TCT-512 (Washington, DC: U.S. Government Printing Office, March 1992).

national treatment would assure only that foreign firms have equal treatment with national firms-who may not be allowed to compete with the national carrier.) The rough consensus that was hammered together to form USTR's negotiating position has tended to erode somewhat over the long course of negotiations and the necessity of compromises among nations participating in the international give-and-take. Both U.S. telecommunications firms and users now tend to argue that a' 'bad' GATT conclusion will be worse than no agreement at all.

USTR NEGOTIATING POSITIONS ARE BEING UNDERMINED BY INSTITUTIONAL AND TECHNOLOGICAL DEVELOPMENTS.

The negotiating positions used by USTR in multilateral and bilateral negotiations in many regards rest on traditional distinctions between public and private networks, between network operators and resellers, between competing technologies, and between basic and enhanced communication services. Many of these distinctions have already been blurred by network interconnection and capacity resale. They are rapidly being challenged by clearly identifiable technological trends and by the innovative services that they make possible. The development of "intelligent networks,' in which programmable logic and customer databases are distributed throughout the system and linked by a common packet-switched signaling system, as described in chapter 2, allows network services to be thoroughly customized. This leads to pervasive commingling of carrier-provided and user-provided network facilities, logic, and databases. These technologies and services make it both difficult and ultimately unproductive to maintain distinctions between public and private networks and between basic and enhanced services. Trade agreements based on distinctions that are already becoming obsolete cannot be enforced or adhered to in the long term.

Trade agreements that distinguish "basic" from "enhanced" services will be undercut by changing technology and industry restructuring.

The international telecommunications arena is marked by increasing complexity in the nature of relationships among industry participants and between industries and governments. There are many new players—wireless communications companies, resellers, private network operators, value-added service providers—in markets previously dominated by single national firms. National carriers are for the first time competing with each other in global markets and at the same time are partnering in joint ventures. National authorities are struggling to develop transparent regulations where before they acted by fiat. Governments are struggling both to gain the advantages of competition for their consumers and corporate users, and to protect their national carriers and national equipment manufacturers.

Even as the Uruguay Round labors toward a conclusion after repeated suspensions and extensions, the future of multilateral trade regimes is being questioned because of the coalescence of regional trading blocs and waves of political change and restructuring that increase the difficulty of concluding stable trade agreements. It is unlikely, nevertheless, that the tradability of services, including telecommunications services, will ever again be questioned. A series of bilateral and regional agreements, most recently the North American Free Trade Agreement (NAFTA), have codified principles that have reached widespread agreement. (See chapter 7.)

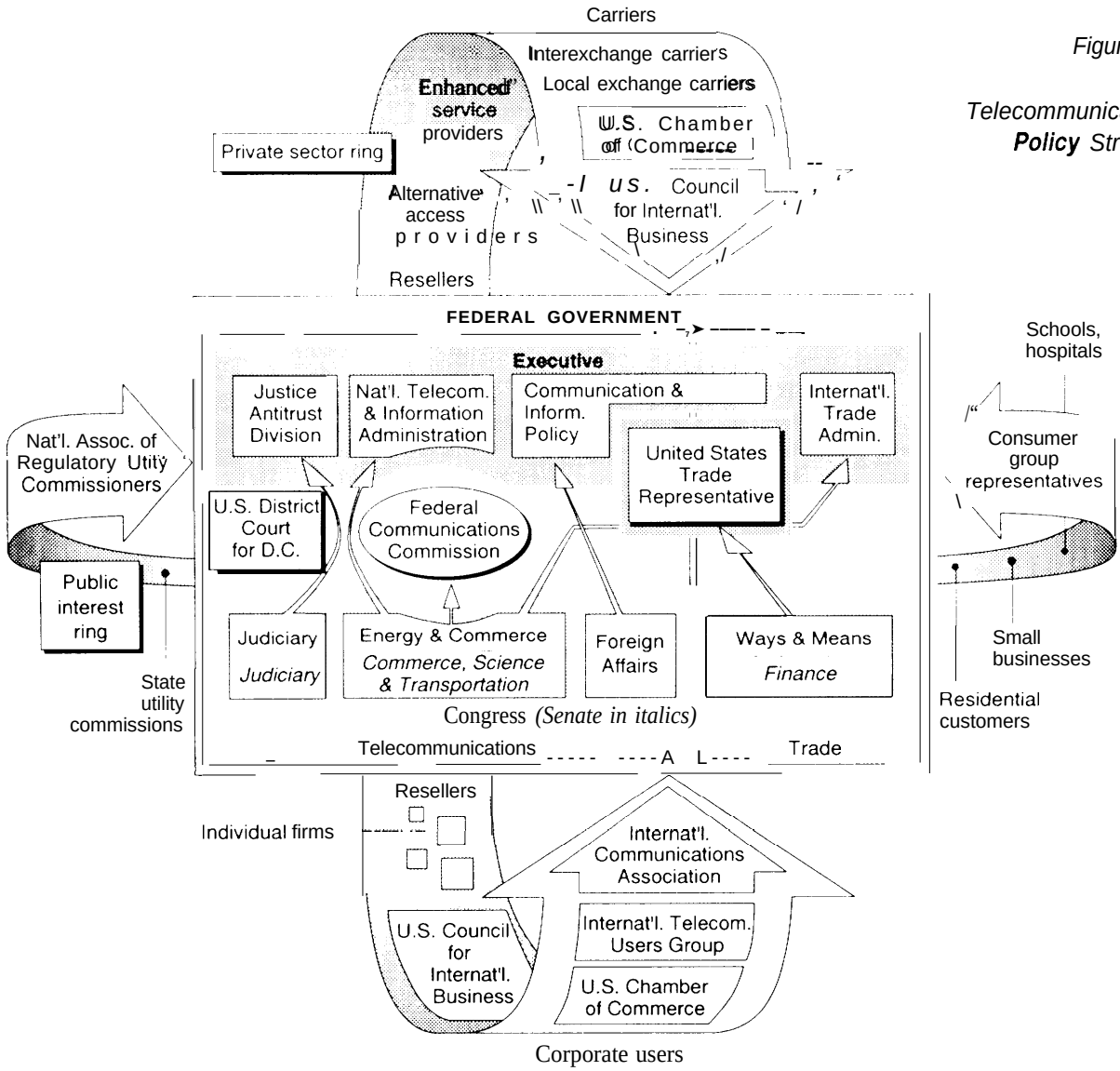


Figure 1-3.
Us.
Telecommunications
***Policy** Structure*

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

When telecommunications policy is subordinated to trade policy, other national goals and interests may be ignored.

FORMAL RESPONSIBILITY FOR DEVELOPMENT OF U.S. TELECOMMUNICATIONS POLICY IS DISPERSED, AND COORDINATION MECHANISMS ARE WEAK.

Policy concerning international telecommunications, until very recently, was an incidental byproduct of domestic telecommunications policy. For over a decade, the telecommunications industry has been allowed to frame and articulate the goals of telecommunications policy with relatively little effective counterbalance from the executive branch of government. The diversity of "the telecommunications industry' means that there are many conflicting interests and perspectives, but a narrow range of policy goals on which to agree. Domestic telecommunications policy has since 1978 focused almost exclusively on the divestiture of the Bell system and deregulation.

The divided and dispersed structure of Federal responsibility for telecommunications policy contributed to this outcome. Organizational fragmentation has some advantages—it provides alternative fora for competing interests to be heard and resolved. The fragmentation may also be necessary, since there is a role for both a policy-development organ within the executive branch and an independent regulatory commission outside of Administration control. Since their immediate goals are sometimes divergent, there is probably also a need for a coordinator or mediating mechanism, especially in dealing with international telecommunications, where it is desirable that U.S. policy be articulated clearly and unambiguously. There is such a coordinating mechanism located somewhat obscurely in the Department of State—the Bureau of Communications and Information Policy—but for true coordination there needs to be some coherent and comprehensive policy that bridges the interests of carriers, services providers, and large business users.

The National Information Infrastructure advocated by the present Administration could also become an appropriate model for the evolution of a global information network—if the United States takes the lead in developing and coordinating international telecommunications policy. U.S. telecommunications policy should incorporate the national interest in global networks; for example, the national interest calls for network interoperability and service for small as well as large users. At present, there is no such policy, no effective coordinating mechanism, and no leadership in articulating the national interest in telecommunications.

The National Telecommunications and Information Administration (NTIA) is embedded in the business-oriented Department of Commerce, which has many competing constituencies and has in the past had relatively weak and diffuse channels to Administration decisionmakers. NTIA is strongly oriented toward representing carriers, but tends to be paralyzed by the often conflicting interests among local exchange carriers and interexchange carriers.

The FCC Common Carrier Bureau has until the last 2 years tended to give little attention to international issues, The FCC Office of International Affairs is relatively new and has primarily an internal coordination function. The FCC, as an independent regulatory agency, is outside of and sometimes at odds with Administration policymaking. This often provides a valuable ''check and balance' on policy development, but the Commission sometimes acts unpredictably, in violation of U.S. trade

policies and its own standing rules and policies.[9]

The State Department's Bureau of Communications and Information Policy (CIP) has the legislative mandate to coordinate telecommunications policymaking among and between FCC, NTIA, and other executive agencies. The selection of the State Department as the site for coordination of telecommunication policy represented first the perception held by the Administration at that time that telecommunications is primarily a service for multinational corporations engaged in world trade, 10 and secondly a way of extending congressional oversight of telecommunications trade issues.[11] CIP has however recently been largely ineffective both in its coordinating role and in contributing substantively to development of telecommunications policy, functioning largely as a clerical facilitator for industry/government participation in international meetings. Its effectiveness may be further lessened by a current State Department plan to degrade it from Bureau status to that of an office within another Bureau. To make CIP an effective tool for coordination of telecommunications policy would require restructuring, refunding, and restaffing. It would also require a hospitable environment within the State Department, one that recognizes the essential role of telecommunications in governance and in the conduct of foreign affairs.

EFFECTIVE RESPONSIBILITY FOR INTERNATIONAL TELECOMMUNICATIONS POLICY HAS FALLEN TO USTR, A TRADE AGENCY. THIS CONSTRICTS AND DISTORTS THE FORMULATION OF TELECOMMUNICATIONS POLICY.

The formulation and implementation of international telecommunications policy, because of the 1988 Trade Act, has come to be dominated by trade negotiations. The United States Trade Representative has in effect played the role envisioned for CIP, USTR consults other agencies in depth and at great length, but when strong interagency differences arise, USTR generally prevails, especially since telecommunications agencies do not have a seat on committees that resolve

[9] For example, the FCC allowed Telefonica of Spain to buy the Puerto Rico Telephone Co., although U.S. telecommunications firms do not have full access to Spain's market. The Commission also did not impose any conditions related to Telefonica adopting cost-based accounting rates, as called for in FCC's CC Dec. 90-337 (Phase II) (Nov. 5, 1992). The FCC has established "benchmark" U.S.-Europe accounting rates of $0.46 to S0.78, to be achieved within a year; existing accounting rates with Telefonica are $1.26 to $1.96. See ch. 3 for explanation of the accounting rate issue.

[10] It was, however, the preceding CarterAdministration that in 1978 removed the Office of Telecommunications Policy from the Executive Off Ice and placed it in the Department of Commerce. This appeared to signal a change in perspectives, from viewing telecommunications as a powerful tool for governance and social policy Implementation, to an industry that produces goods and services for business users.

[11] Communications primarily falls within the jurisdiction of the Senate Committee on Commerce, Science, and Transportation (Subcommittee on Communications) and the House Committee on Energy and Commerce (Subcommittee on Telecommunicateions and Finance). Ot her comm it tees, including for example the Senate Committee on Finance (Subcommittee on International Trade) and House Committee on Foreign Affairs (Subcommittee on International Economic Policy and Trade), are concerned with international trade Issues. The House Committee on the Judiciary has played a strong role in telecommunications issues, having responsibility for "protection of trade and commerce against unlawful restraints and monopolies. " The location of the Coordinator in t he State Department assures that trade and foreign affairs committees will have some oversight over telecommunications.

these differences. In the future, however, formal trade negotiations may be less critical than technology and users' needs in determining the competitiveness of U.S. telecommunications firms in foreign markets. The industry structure, investment patterns, research expenditures, and risk exposure cannot be effectively monitored by trade negotiators.

The central role of USTR in international telecommunications policy has had some advantages: it has imposed a degree of unity on representation of U.S. positions in global issue resolution; it has kept telecommunications trade issues under scrutiny by several congrcssional committees with a broad perspective on global economic trends: and it has given increased representation and importance to large business users of telecommunications. to whom USTR has built strong bridges, while telecommunications agenies appear to listcn more attentively to the major carriers. However, the dominance of USTR further reinforces the compression of policy formulation into a single dimension, the opening up of foreign markets. The established relationships and operating procedures between the telecommunications agencies (NTIA, FCC, and CIP) and internaational institutions such as the International Teleccommunications Union (ITU) are being superseded by trade negotiations, and some historical principles and procedures for cooperation and control may be effectively lost as a result.

The dominant role of USTR is also subject to other criticism. Some communications industry representatives fear that subjecting telecommunications to broad trade principles may result in the asymmetrical opening of U.S. markets without providing equal access for U.S. firms to foreign monopoly-dominated markets. GATT agreements could supersede provisions of domestic law and regulation. Some stakeholders assert that trade negotiators do not have full understanding of highly technical telecommunications issues, and work on the basis of existing distinctions and categories that will be rapidly made obsolete by already emerging technological changes.

U.S. POLICY FOR INTERNATIONAL TELECOMMUNICATIONS LACKS AN INFORMING VISION.

The fragmented structure for telecommunications policymaking and the narrow focus of both domestic and international telecommunications policy has allowed policy formulation and implementation to be driven by the needs of a relatively few private sector stakeholders (carriers, equipmcnt manufacturers, certain large business users), with government taking a hands-off position. Communications is *not* merely a utility for facilitating business competitiveness or a tradable commodity. Communications is also a basic prerequisite of effective democratic governance, an essential foundation for scientific endeavors, a channel for conducting foreign relations and cooperative activities, and a critical element in national security and global peacekeeping.

For over a decade, however, the national administration has largely renounced any voice in determining the structure, investment strategies, and technology development policies of this core industry. For example, Europe and the United States increasingly tend to differ in the approach to network architecture. In Europe, relatively more centralized ''intelligence (computerization) is integral to the network, while in the United States there is a tendency to use more sophisticated termiinal equipment, owned by

the user. There arc many advantages to the latter approach, but on the other hard, building advanced capabilities into the network may facilitate uses of telecommunications by middle-sized and even small firms that could not afford the specialized customer premises equipment. In a global economy, the competitiveness of smaller firms may turn out to be important; in addition, smaller firms have a better track record in the United States of creating jobs than have large corporations. Telecommunications policy, not trade policy, is the appropriate vehicle for considering strategic alternatives of this kind.

Notwithstanding the often-conflicting initiatives of congressional committees and attempts by a few congressional leaders to put forward a vision of the possibilities of [b]'electronic highway s,' domestic telecommunications policy has largely been articulated by the judicial branch of government. No agency, including the FCC as an independent regulatory agency, has attempted to modernize or translate the old objective of "Universal Service" in terms of new and advancing technologies. " Existing policy goals remain narrow': progressive deregulation at the domestic level; opening of foreign markets at the international level. This may result in:

- Neglect of goals othcr than market access, such as the most efficient interconnection of networks and developmcnt of a full spectrum of services for small business and residential consumers as well as large businesses;
- Inattention to costs and risks such as weakening of regulated domestic subsidi - aries or disinvestment at home;
- Complete subordination of telecommunicat ions policy to more general trade prin - ciples, ignoring special characteristics of telecommunications services;
- Continuing confusion and conflict over the question of what the national telecommunications infrastructure, and its connections to global networks, should be like at the beginning of the 21st century.

CORPORATE LEADERS GATHER IN A FIELD OUTSIDE DARIEN CONNECTICUT, WHERE ONE OF THEM CLAMS TO HAVE 5EEN THE INVISIBLE HAND OF THE MARKETPLACE.

DRAWING BY DANA FRADON, © 1992, THE NEW YORKER MAGAZINE, INC

Under the present, dispersed policymaking structure, attention to such aspects of international telecommunications may not be adequate.

U.S. PARTICIPATION IN EUROPEAN MARKETS FOR TELECOMMUNICATIONS SERVICES IS IN ACCORD WITH U.S. ECONOMIC INTERESTS AND SUPPORTS U.S. TRADE GOALS.

Export of services is now, and increasingly in the future, important to the U.S. economy. Concern about the Unitcd States' long-term balance of payments has mostly focused on the continuing trade deficit in manufactured goods; but services exports are now more than one-third as large as our export of goods and growing faster, with

Europe as the primary foreign market. The United States has a healthy trade surplus in services, partially offsetting the troublesome merchandise trade deficit. The increased export of enhanced telecommunications services and closely related information services can add significantly to this surplus. (See chapter 3.)

Telecommunications and information services are a relatively small part of all U.S. services exports--only about 2 percent-but they hold the opportunity for strong growth. U.S. firms have a competitive edge in delivering telecommunications and information services because of their experience in competitive markets and in developing innovative, user-tailored services based on advanced transmission and network technologies. Other U.S. firms operating in or selling to Europe benefit by the availability of U.S. telecommunications services. (See chapter 5.) The sale of telecommunications services overseas can also stimulate foreign demand for U.S. telecommunications and computer equipment.

In contrast to the overall surplus in trade of services, the United States now has an overall trade deficit in telecommunications services. (See figure 1-4.) This deficit, however, is not due to lack of competitiveness, but to the excellent performance of U.S. telecommunications providers in comparison with European telephone systems. The deficit results from international accounting rates. A carrier originating an international call pays a foreign carrier to route the call to its final destination. Countries from which more calls are made thus see a net outflow of payments. More international calls are made from the United States than are made to it, because of our large industrial base, large population, and high per capita income, and because we enjoy much lower communications tariffs and greater access to useful services than most countries.

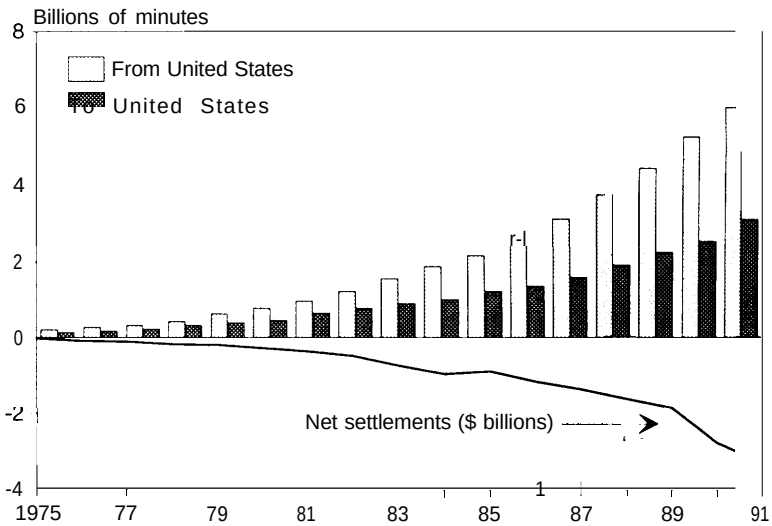
It is important to correct the accounting rate deficit, but this will require both renegotiation of accounting rates to reflect real costs (which will mean lower accounting rates), and lower customer charges in foreign countries to reduce the asymmetry in telecommunications usage. But the accounting rate deficit can also be partially counterbalanced by growth of the still-small U.S. export of enhanced services (in which we now have a healthy trade surplus), with the additional benefit of supporting the competitiveness of other U.S. firms in Europe. (See figure 1-1.)

The success of U.S. telecommunications and information services firms in international markets is important to the U.S. economy. Most research on the employment effects of trade has dealt exclusively with export and import of merchandise, but available projections indicate that exports of services create U.S. jobs and that these jobs have relatively higher pay than other services

12 Accounting rates are discussed further in chapter 3. They are negotiated between carriers and are independent of customer charges and of actual costs of message delivery.

jobs. [13] However, there is relatively little evidence for this proposition, probably because the concepts of 'trade in services' or [b]'services exports' are themselves new and because statistics on trade in services are inadequate (see chapter 8).

Some services, for example financial services, have been directly exported for centuries (e. g., bills of exchange), but the direct electronic export of enhanced services has burgeoned only recently.[15] Most telecommunications services are delivered overseas through direct overseas investment in subsidiaries and joint ventures. It is difficult to judge the impact of such corporate overseas investments on U.S. income, jobs, profits, and general economic welfare. Offshore operations financed by direct investment generally create jobs and secondary income in the foreign country, not in the United States, but profit repatriation must also be taken into account. Profits flowing back to a U.S. parent firm increase the value of the domestic corporate enterprise, and arc assumed to strengthen its growth prospects and stimulate domestic employment and income. Foreign services firms entering our markets



SOURCE FEDERAL COMMUNICATIONS COMMISSION, 1992.

Figure 1-4. Telecommunications Traffic Balance

NOTE Does not Include traffic with Mexlco and Canada.

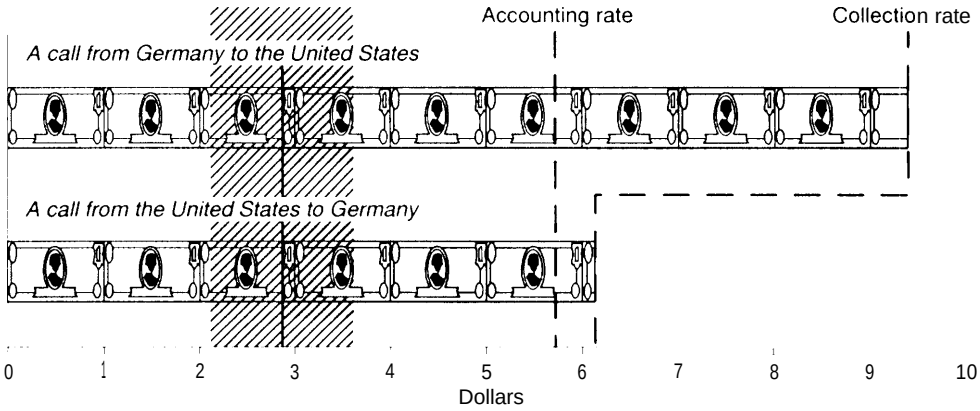
[13] For example, the Department of Commerce has estimated that 7.2 million U.S. jobs were directly or indirectly supported by merchandise exports in 1990. This study included some service-sector jobs indirectly supported by merchandise exports, but it expressly did not include jobs supported by exports of services. U.S. Department of Commerce, U.S. *Jobs Supported by Merchandise Exports,* April 1992. The Office of the U.S. Trade Representative matched this data, disaggregated by industry, with average hourly wage data supplied by the U.S. Bureau of Labor Statistics, and concluded that the average hourly wages for services jobs within merchandise-export ing firms were nearly 20 percent higher t han services jobs in nonexporting manufacturing firms, USTR's analysis included a comment that "there is every reason to believe that the same pattern of higher wages in companies exporting services would also prevai l." See USTR, "U.S. Exports Create High-Wage Employ merit," press release, Washington, DC, 1992, p. 4.

[14] A newspaper projection pointed out that if U.S. export of services grows between 9 percent (recent annual growth in the domestic services sector) and 14 percent (recent growth in services exports) it will reach an annual total of between S206 and $257 bi lll on by 1996, and t he statement was made that this could create 5 million new jobs. Stephen Kindel, "Invisible Trade," *Financial World*, Oct. 13, 1992, pp. 56-69. According to Kindel, t he employment est I mate was based on the number of jobs that USTR estimates are created by Increases in U.S. exports of goods, but this number was arbitrarily reduced by half on the grounds t hat the services jobs would be, on average, more highly skilled and highly paid than most manufacturing jobs.

[15] During thesame period, telecommunications companies—includlng U.S. long-distance carriers and local exchange carriers—have been undergoing rigorous "downs sizing" butt his job destruct ion does not appear to be tied to concurrent overseas expansions. Similarly, there is evidence of some migration of data processing and other information Industry employment to offshore locations, but no evidence that this is related directly to export of services.

Figure 1-5. Accounting and Collection Rates for International Telecommunications Traffic

A comparison of a 5-minute, peak-time call between the United Stated and Germany, 1991



Amount paid to the correspondent carrier to complete the call, as per the accounting rate

Amount retained by operator originating the call

Estimate of carriers' costs

NOTES: The accounting rate with Germany in 1992 was 0.8 special drawing rights or $1.14 (FCC, Statistics of Communications Common Carriers, 1991 /1 992 Ed.). The collection rate (i e., what the caller is charged) for the U S.-to-Germany call is calculated as $1.77 [for the initial m mute] + 4x$1 .09 -.$6.13 (FCC), The collection rate for the Germany -to-U.S. call is derived from 5x$1 88 (TeleGeography 1992, International Institute of Communications). The costs to the carriers are estimated at SO.15 per m inute at both the U.S and German end; this number is conservative.

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

under trade agreements also create jobs here. Unfortunately, economists have not developed a credible way to track and calculate the net benefits of these competing effects, especially for services firms. [16]

In some industries, lower costs of production in foreign markets—often, lower labor costs-have caused offshore facilities to displace plants in the United States. But in other industries, particularly those with global sales and increasing "returns-to-scale,' [17] the most able firms are those with extensive global operations. In some businesses, too, access to customers with different preferences, markets with different standards, and researchers with a wide variety of approaches to problems is an asset, In such industries, foreign investment is likely to result in a bigger pool of investment capital for all the company's establishments.l[8]

Those industries where offshore operations are likely to displace domestic ones consist mainly of commodities like wheat, textiles, apparel, and lumber.[19] In the other

[16] James K. Jackson, "American Direct Investment in the European Community," Congressional Research Service Report for Congress, June 9, 1992.

17 "Increasing returns to scale" means that, within a generous limit, the more the company produces of its product the cheaper the costs of production are, per unit, and the better off it is, competitively.

[18] U.S. Congress, Office of Technology Assessment, *Competing Economies: America, Europe, and the Pacific Rim*, OTA-ITE-498 (Washington, DC: U.S. Government Printing Office, October 1991).

[19] These goods can be produced by well-known and straightforward methods, usually in establishments which, when sized to be efficient, add no more than small increments to global production.

category are industries where the most experienced and large-scale producers are the most efficient and innovative, both because of increasing returns-to-scale and because of the enormous amount of know-how and technology embodied in the production and delivery of the output. The telecommunications services industry is in this category. Increasing returns-to-scale was the justification for its traditional status as a regulated monopoly. Provision of high-quality services is highly dependent on vast inputs of technology and decades of accumulated know-how.

Limits on the ability of the telecommunications industry to invest in and serve fast-growing, complex foreign markets would likely prove a disastrous competitive disadvantage. The speed of innovation and the shortening half-life of products is a powerful argument for global operations. Slower market growth in the United States would not continue indefinitely to encourage rapid innovation, while in faster-growing foreign markets there will be the opportunity to experiment fruitfully with different technology, different demands, and different standards.

The United States is now operating in a global economy. It must begin to balance its imports with exports-of services as well as goods. Telecommunications equipment and services is a sector in which U.S. firms excel. The European market for telecommunications services is both growing and moving toward liberalized entry. The U.S. Govcrnment can encourage and hasten this increased opportunity through trade negotiations and other actions. Whether U.S. firms can remain competitive in this market will also depend on other factors: technological superiority, management skills, access to affordable capital, well-trained human resources, and U.S. regulatory policies. The strategies being used by U.S. telecommunications firms to compete in the European market arc described in chapter 4.

Conclusions and policy options

U.S. telecommunications firms and enhanced-services providers are well positioned to compete in European markets for services, to the extent that those markets are now open to them. A combination of technology, market forces, and institutional pressures is converging to force open much of the telecommunications services market that is now closed to all competition-the opportunity to bypass monopolistic public telephone operators has been thrown open.

Congress need do little to enlarge the competitive opportunities for U.S. telecommunications services providers in Europe, except for encouraging the President and USTR to continue to push for the liberalization of European telecommunications markets, and to support efforts of the European Community to establish a single European market for telecommunications. No *other actions are clearly needed.* There is a strong likelihood that European markets will continue slowly to liberalize and move toward greater integration.

There are two other unresolved issues that Congress may want to address:

- The risk of disinvestment or inadequate investment in domestic infrastructure as a result of overseas investment by the major long-distance carriers and the holding companies that include regulated local exchange carriers; and
- The weak and ineffectively coordinated Federal organizational structure through which national telecommunications policy is developed and implemented.

The Office of Technology Assessment found only mixed and inconclusive evidence for inadequate or declining investment in domestic infrastructure. There may be no significant trend in that direction; yet if there is, the long-term consequences would be serious. *In order to resolve this question for purposes of future oversight and policymaking, Congress has options:*

- Congress could instruct the FCC to monitor and report on all telecommunications activities and investments overseas, on the source of capital for these investments, and on the financial condition and resources of carriers undertaking such activities.

  An appropriate monitoring system would also require reporting, in standardized format, of annual investment in infrastructure modernization and in research and development.
- Congress could request consultation and cooperation among State regulators through the National Association of Regulatory Utility Commission (NARUC), with support from the FCC, to develop joint strategies for protecting consumer rates, requiring minimum infrastructure investment, and other protective measures.

The publicly available data about carrier investments in infrastructure modernization or in research and development is not adequate to allow decisionmakers either to accept or to reject a trend toward ‘ ‘disinvestmerit. ’ The first step, therefore, is to create a monitoring system that can track both investment in plant and equipment and investment in research and development.[20] If a consistent pattern or trend of disinvestment appears, Congress and/or the states can then consider legislative remedies, including deregulation, redefinition of depreciation rates, tax inducements, or tax penalties to correct the situation.

State regulators are vitally concerned with this issue, but they may lack the resources and the geographical span of authority to track investments. Congress may therefore wish to ask the FCC to report regularly on patterns of investment.

In order to encourage the development of more comprehensive, coherent, and vision - ary international telecommunication.Y policy, Congress may wish to consider..

- Declaring goals and priorities for international telecommunications development and deployment that include, but arc not limitcd to, export and trade goals:
- Consulting with the Administration to call attention to the importance of clear definition and location of responsibility for executive policy articulation and implementation and to cooperatively create a mechanism for consultation and coordination between executive agencies and FCC;
- Mandating a restructuring of the policymaking structure, possibly
  - -creating a new Office of Telecommunications Policy within the Executive Office, *or*
  - —restructuring, refunding, and restaffing the coordinating function/position within the Department of State. *and*
  - —limiting the responsibility of USTR by setting congressional policy guidelines for or limitations on bilateral and multi -

20 Eight major carriers told the Office of Technology Assessment that they strongly object to the concept of monitoring as an additional paperwork burden. Although any well-run corporation has such Information for internal decisionmaking, it is jealously guarded so t hat it will not fall into t he hands ccompetitors and critics.

lateral negotiating positions with respect to telecommunications.

The three primary options (congressional restatement of policy goals, active consultation and collaboration with the Administration, and strengthening the policy implementation structure) are not mutually exclusive, but could be strongly reinforcing. The most active of these options, organizational restructuring, involves alternative approaches.

Creating a small policy office within the Executive Office would signify the importance of telecommunications and the recognition that there is a national interest in the health, structure, and operations of the industry that is responsible for this essential infrastructure. It would provide a voice in top-level deliberations. However, this action to be effective must reflect the willingness and intent of the Administration to make use of such an office. Past experiment has shown that additions to the Executive Office that are forced on an unwilling President accomplish little.

Revalidating and reinvigorating the role of the State Department's Bureau of Communications and Information Po] icy reasserts the interests of a number of congressional committees and subcommittees in international telecommunications. It would, however, also require the assent and collaboration of the Administration and Secretary of State and a reversal of current plans to downgrade the Bureau. Historically, the Department has shown little understanding of the effects of technology on the Nation and on relations between nations, and has not afforded much influence or prestige to its bureaus that are concerned with science and technology. A stronger position and voice within the Department, which can only be effected by those heading the Department, is a necessary prerequisite for making CIP effective. However, Congress can through its funding and oversight roles encourage this to happen.

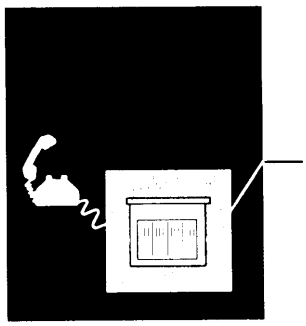
While the United States Trade Representative is also an executive branch office, restricting and directing the USTR role in telecommunications policy fomlulation would be an appropriate reassertion of Congress' primary responsibility for U.S. trade policy, trade relationships, and conduct of other, nontrade, international relationships. Stating such policy guidelines could take the form of a general declaration of telecommunications policy goals and need not unduly limit trade representatives in active negotiations any more than does any prior fomlulation of negotiating positions. The difference is that these positions have recently been formulated entirely within USTR, with little prior congressional instruction, or discussion.

Uniformity, single-mindedness, and a narrow focus are not desirable in formulating international telecommunications policy, but ultimately some consensus and concerted representation is needed in national and international decisionmaking.

There is a national interest in the health, structure, and operations of the telecommunications industry that includes, but is not limited to, competitiveness in world markets.

Technological Trends and Issues

CHAPTER 2



Technological trends will increase need for international standards, and will challenge the viability of traditional standards processes.

EMERGING TECHNOLOGIES AND INNOVATIVE, **SOFTWARE-BASED SERVICES are undermining** some U.S. telecommunications regulations and policies. Intelligent networks and information-based services will make it increasingly difficult to draw clear boundaries between public networks and private networks and between regulated ''basic' telecommunications services and ''enhanced' services. Such technological change may make the negotiating positions developed by the Office of the United States Trade Representative (USTR) irrelevant by the time they arc embodied in treaties, trapping the United States in agreements no longer in its best interests. These technological trends will both increase the need for international standards, and at the same time challenge the viability of traditional means of developing standards.

The broad technological trends that will shape the networks of tomorrow stem from three fundamental developments: 1) the progressive increase in processing power of microelectronnic circuitry, *2)* the continuing improvement in fiber optics, and 3) fiber optics: extraordinary reduction in cost. The first provides the necessary processing power for advanced switching systems and for compressing information signals into ever-smaller bandwidths. The second provides both vastly improved transmission quality and the necessary transmission capacity for bandwidth-intensive services that combine voice, data, and video signals.

Changing technology

Eight broad technological trends should be noted:

- conversion from analog to digital transmiss ion,
- common channel signaling,
- unbundling of stored-program control switching functions,
- advances in transmission systems,
- advances in digital multiplexing,
- advances in packet switching,
- mobile communications, and
- greater functionality in terminal equipment.

The most basic and important of these trends is the progressive conversion from analog to digital systems. The great advantages arc better performance, easier multiplexing,[2] easier encryption, easier sig - naling, better monitorability of performance, integration of switching and transmission,

NOTE: Much of the material in this chapter is based on an Office of Technology Assessment contractor report: Hatfield Associates, Inc., *Advanced International Telecommunications Technologies and Services,* December 1992.

[1] In an analog system, the signal weakens and becomes corrupted by noise and distortion as it moves along a wire, unless it is regularly boosted by am plifiers. But am plifiers cannot distinguish signal from noise, and they boost both, while adding some additional noise and distortion. These distortions accumulate over a long transmission path until the desired signal may become almost unintelligible. In a digital system, regenerators are used along the path rat her than am plifiers. Regenerators merely detect whether a pulse is present and, if so, they generate and send on tot he next regenerator a new (noise-free) pulse. The same sequence of pulses presented at the beginning is delivered at the end without weakening and without the accumulation of noise and distortion.

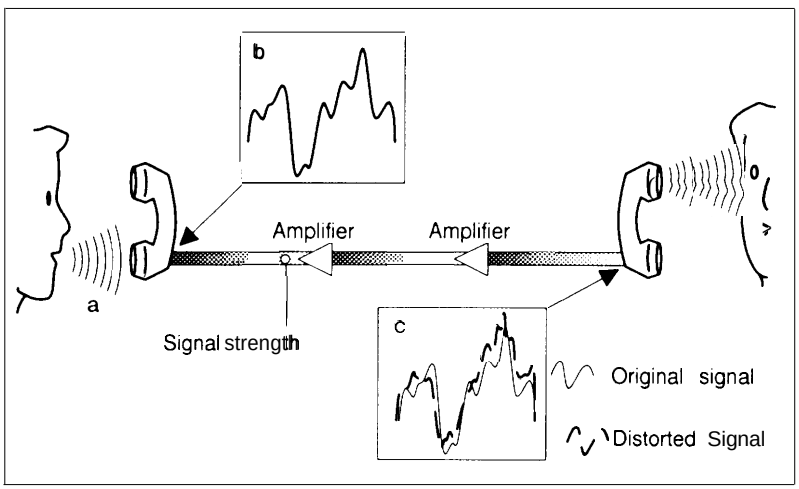
[2] Multiplexing is the process of combining multiple signals into a single channel for transmission over a common facility, e.g., a lightwave or radio carrier, thus Increasing effective capacit y.

and accommodation of other services.[3] Compression techniques are steadily reducing the number of bits per second that must be transmitted to reproduce a given signal, and advanced modulation techniques allow higher bit-rates to be transmitted per unit of bandwidth. (See figure 2-1 and 2-2.)

A second important trend is common channel signaling, or separating voice traffic from signaling. Signaling is the information associated with setting up, maintaining, and taking down calls. Until recently, analog tones were used to convey signaling information, which was carried on the same channel as the voice conversation. With common channel signaling, all of the signaling associated with multiple conversations is handled on a common packet-switched subnetwork. Conversation channels are circuit-switched, while signaling information in the common channel is digitized and packet-switched. Common channel signaling is faster than traditional analog signaling, allowing calls to be set up faster. The signaling does not consume conversation capacity on the trunk. The network can ‘ ‘look ahead” to see if lines or trunks are busy before setting up a call on the circuit-switched network, and then pick a route through the network that minimizes congestion. These improvements become even more powerful when enhanced computer processors and databases are added to common channel signaling to create ‘‘intelligent networks.

A third trend is toward unbundling of stored-program control switching. Modem computerized or stored-program circuit switches are composed of two basic parts—the matrix where physical connections arc made between circuits, and a processor that contains the logic that controls the switching. In early ‘‘stored program control switches, the switch (matrix) and processor elements were integrated. (In computer terms, there was no separation between the “application program’ and the "operating systern, ’ The customer could not modify the switch software to create new or changed services-the switch manufacturer had to do that, usually with a new switch.

Separating the switch control from the lower-level switching functions allows networks to be programmable by a carrier, an enhanced services provider, or the customer/end-user. In the case of a public network, a local switch can suspend an incoming call, look up the called number in a database, and route the call to the intended recipient at another number and location (call forwarding). In a corporate network, a private branch exchange (PBX) can be linked to external computers; calls can be delivered to particular corporate agents along with different screens of information depending on the



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

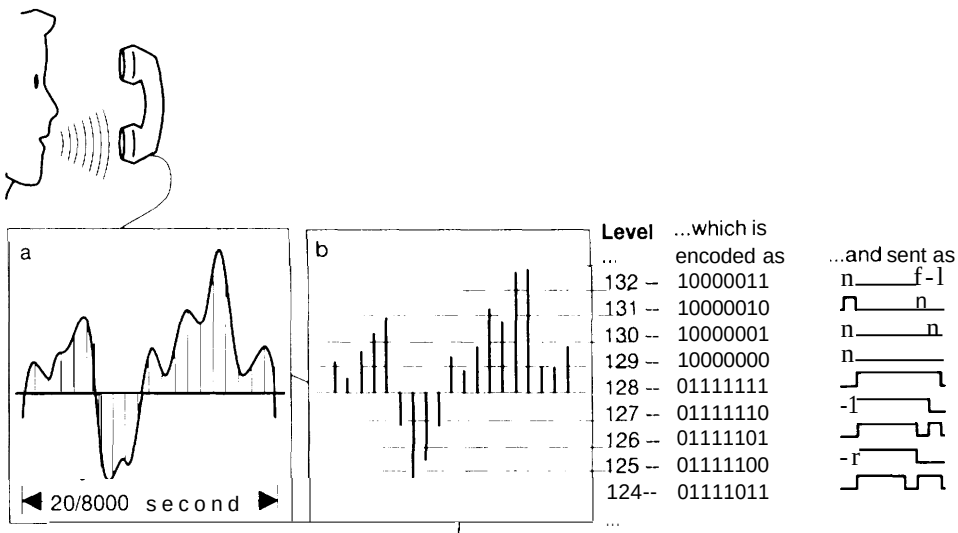
Figure 2-1.
Analog Transmission

NOTE In order to transmit a voice over the telephone network, the soundwaves (a) are converted to a corresponding electrical wave (b) when the waves contact the mouthpiece of the telephone handset. The signal weakens as it travels along the wires of the network, and therefore must be amplified at intervals The signalinevitably picks up noise and distortion, and this noise and distortion is included with the original sound when the signal IS amplified (c)

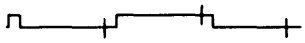
[3] John Bellamy, *Digital* Telephony, 2nd Edition (New York, NY: John Wiley& Sons, Inc., 1991).

Figure 2-2.
Digital
Transmission

SOURCE OFFICE
OF TECHNOLOGY
ASSESSMENT, 1993.

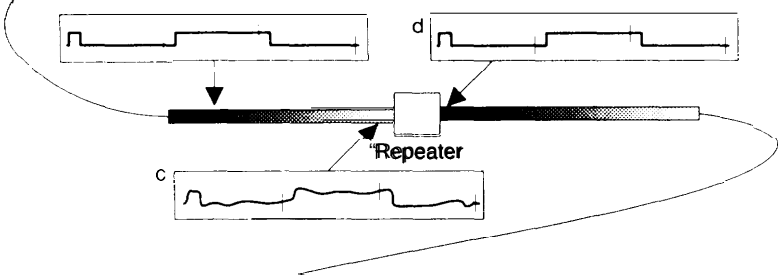


In a digital system, the soundwave is sampled (a) at sufficiently close intervals (1/8000 of a second) to very accurately reproduce the wave's shape. The amplitudes of the samples are then quantized (b) -- or given approximate values according to the range into which the amplitude falls. The new signal is encoded into an 8-character binary format (which permits 256 possible levels) for transmission through the network. In this example, the digitized signal would be:

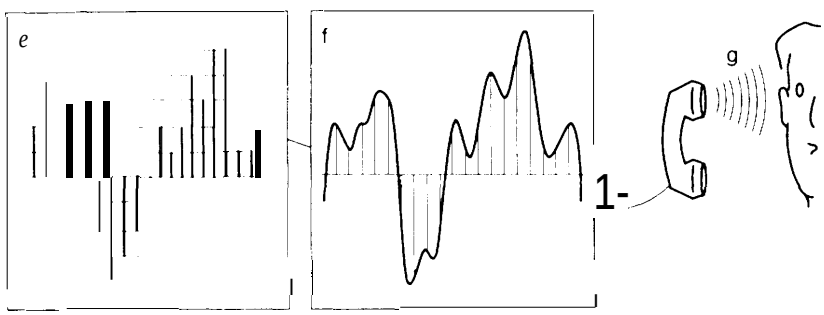


10000000,01111111,10000000 ,.. (129, 128, 129...)

The digital signal is regenerated rather than amplified (as in analog) during transmission; the repeater reads the deteriorating signal (c) and generates a fresh sequence of 1s and 0s (d).



Finally, the signnal is converted back into an electrical impulse (e, f) and to soundwaves (g).



The "Intelligent Network' '-locating processors and databases throughout the network—permits a wide variety of specialized network services, including virtual private networks.

identity of the customer placing the call. This ccm~putcr/telephone integration is one of the most important trends changing telephony.

The "Intelligent Network" is a natural extension of these advances in switching and signaling. Computer processors and their associated databases arc placed in the network where they can be accessed from the signaling channel. The system uses the calling and called numbers plus other information to handle calls in special ways--e. g., to route calls to different locations depending on the time of day and/or the originating location. Public or private networks can be reconfigured to reflect changing traffic conditions or to respond to network failures. An intelligent network can also create software-defined virtual private networks.

One characteristic of intelligent network concepts is that the call-handling logic and databases can be stored at a handful of centralized locations, to be accessed by a large number of switches. This makes it easy to reprogram them, since the software and databases need be updated only at a limited number of locations. As a result of these developments, the logic and data associated with the handling of individual calls can be optimal] y distributed among customer premises equipment, the local or metropolitan or regional portion of the network, or the long-haul portion, and linked using advanced signaling systems.

Greatly improved transmission systems arc a fourth broad technological trend. Transmission systems for traditional services evolved from open wire line to twisted-pair copper cable, coaxial cable, line-of-sight microwave, satellite, and optical fiber cable. While technological advances have produced significant capacity increases in even the older technologies such as twisted-pair copper cables, the largest increases are associated with the deployment of optical fibers or lightwave systems; these systems operate routinely at speeds as high as 2.4 Gbps (billion bits per second) on a single fiber.

A family of transmission standards now being extensively implemented, called Synchronous Optical Network (SONET),[4] allows transmission rates in the range of 51 Mbps (million bits per second) to 2.4 Gbps. Because SONET uses synchronous transmission, individual channels can be efficiently added or dropped at intermediary nodes without the usc of back-to-back multiplexer. This allows the creation of ring architectures that can provide added reliabil - ity. (See figure 2-3.) Moreover, SONET includes special data channels that facilitate various network management functions such as surveillance and rerouting from a central location. By installing high-capacity facilities to the customer's premises and using the advanced network management features of these systems, additional or reconfigured channels can be provided to the customers quickly, and without an on-site visit by a technician. Through this 'preprovisioning, ' a customer can even get additional capacity by directly accessing the network management system—a form of ''bandwidth on demand.

Packet-switching is another powerful technological trend. The public switched telephone network with circuit-switching was optimized for voice communications. In the

[4] Generally known outside of North America as Synchronous Digital Hierarchy (SDH), the international standard.

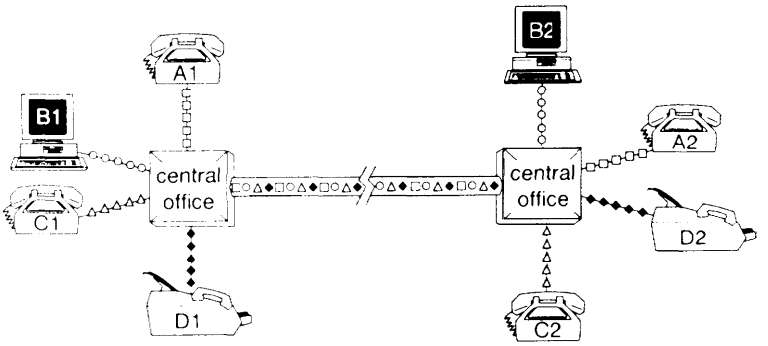
digital mode, it switches 56/64 kbps (thousand bits per second) circuits, corresponding to the uncompressed bandwidth requirements of ordinary voice communications. For data communications, there are two drawbacks to circuit-switching: the inefficiency of having dedicatcd connections when traffic is intermittent or "bursty,' and the constrained 56/64 kbps transmission speed. The lattcr can be partially overcome by modifying or redesigning switches to handle multiples of the *56/64* kbps rate. (This is currently being done to achieve speeds up to 1.5 Mbps.) A wideband, circuit-switched service of this type is appropriate for bulk file transfers, vidcoconfcrencing, and other applications with relatively constant bit-rates.

Traditional packet-switched networks arc effective for handling bursty data, but are currently 1 i m i ted to speeds of about 64 kbps. This is because the packet switch at each network nodc must read the address information, check the data contained in the packet for errors, correct the errors or request a retransmission, reassemble the packet, and forward it to another node. New technology, known generically as ''fast packet-switching, ' can reduce these delays.

Frame relay and cell relay are two forms of fast packet-switching. Both rely on the fact that modern digital transmission systems have very low error rates compared with analog systems, and the end user's terminal equipment now has the processing power to correct errors or ask for retransmission. Both frame relay and cell relay are attempt to improve a situ at ion in which the ability to transmit information at high speeds exceeds the ability of switches to route it. These technologies have given rise to the important developments of Asynchronous Transfer Mode (ATM) and Switchcd Multi-Megabit Data Service (SMDS), described below.

Frame relay utilizes the same type of variable length packets characteristic of traditional packet systems, but the individual packets--called frames-arc relayed through the switch in: nodes with no effort to recover from any errors detected. Much of the error detection and all error recovery is left to the terminal devices. Transmission rates in the 1 to 2 Mbps range arc possible.

Cell relay operates similarly, except that the packets-here called cells—have a short, fixed length, and because of this can be switched at extremely high speeds (in the range of hundreds of megabits per second). The expectation is that the high speeds and small delay will allow integrated combinations of' voice, data and video traffic to be handled through a common switch. With all the transmitted information divided into individually addressed cells, both variable bit-rate (i.e., data) and constant bit-rate (i.e., voice) traffic can be switched. While early applications of cell relay technology are for data communications, the goal is to extend



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

Figure 2-3.
Multiplexing

NOTE Multiplexing is the process of combining multiple signals into a single channel for transmission over a common facility (e.g., lightwave or radio carrier). Multiplexing is used to Increase transmission efficiency by allowing mult @e circuits to be earned by the common facility

Engineering or economic forces are shifting telecommunications intelligence and functionality from the center to the edge of the networks.

the technique to voice and video. In addition, cell relay works in a synergistic way with SONET,

Frame relay is both a technology and a service. It is designed to carry data communications and interconnect local area networks (LANs), and it may be used to transport a variety of higher-level data communications protocols. Frame relay services are being introduced both in the United States and internationally, by U.S. carriers and value-added network providers. European public telephone operators (PTOs) are also planning to introduce public frame relay services.[5] However, there are still unanswered quest ions about performance characteristics and about support from carriers in several countries. A major unresolved issue for the United States is the nature of interconnections between major carriers such as AT&T and MCI. Some users say that national policy should insist on immediate action to ensure interoperability.

Switched Multi-Megabit Data Service is a broadband public data communications service based on the second form of fast packet switching-cell relay. SMDS was developed primarily for LAN-LAN interconnection (i.e., data communications). However, specifications for handling voice and video are being developed. The cell relay structure is compatible with a new protocol known as Asynchronous Transfer Mode intended for use in switching and transmitting voice, data, and video simultaneously.

ATM is the basis for Broadband Integrated Services Digital Network (ISDN), and SMDS could be an interim step pending the arrival of Broadband ISDN.[6] The standards for Broadband ISDN are not fully developed. One configuration would provide for a channel of approximately 150 Mbps to customer premises, with integrated switching and multiplexing.[7] This would allow transmission of high-quality, two-way video telephone and vidcoconferencing, and other multimedia services combining audio, video, graphics, text, and data. There is still much uncertainty about architecture and standards for this development.

Another marked trend is toward wireless or mobile communications, with the rapid growth of pm-table communications including cellular- mobile radio, specialized mobile radio, cordless telephones, and radio pagers, and in the future wireless forms of Personal Communications Services (PCS).[8] Some observers suggest that there may be a fundamental shift in the way people communicate, with access to telecommunications services through wireless technology becoming the rule rather than the exception. (See figure

[5] Robin Gareiss, "International Frame-Relay Services Expand," *Communications Week,* November 1992, p. 27; Peter Heywood and Elke Gronert, "Public Frame Relay Goes Global," *Data Communications*, March 1992, p. 77.

[6] "SMDS: The First Broadband Public Network Service," supplement, *Business* Communications Review, 1992, p. 6.

[7] Another possible configuration calls for four channels, butt his is considered unlikely to be deployed in t he foreseeable future.

[8] Donald C. Cox, "Wireless Network Access for Personal Communications," */EEE Communications*, December 1992, p. 96. Some studies suggest PCS could find 100 million customers ın the United States.

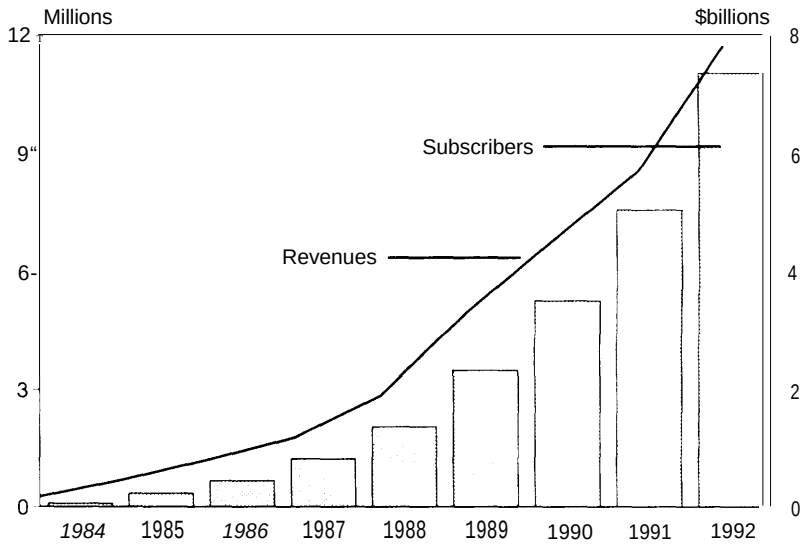
2-4.) Rapid growth[9] has been encouraged by government actions to reallocate spectrum for advanced mobile communications systems. by the continued increase in processing power (e.g., Digital Signal Processing chips, or DSP), by steady improvements in battery technology, and by increased use of computers within the supporting land-based infrastructure.

Still another trend shaping telecommunications networks is increased functionality in terminal equipment. The provision of terminal equipment has been deregulated in many countries and the markets arc intensely competitive. Intelligence and functionality in terminal equipment at the edge of the network can substitute for intelligence and functionality within the network. For example, frequently called telephone numbers can be stored either: on a [b]'smart card' that is plugged into a handset. in the terminal equipment itself. within a telecommunications network (e.g., in a PBX or CENTREX), or at some common location or database accessible to the customer from any network.

Hard engineering or economic reasons arc leading to locating intelligence and functionality at the edge of the network rather than internal to it. It may also be done to respond to customer preferences. Some customers want to develop proprietary solutions to their communications needs to gain some competitive advantage, and such customization may be difficult on a network designed to serve general requirements. Other customers may feel more secure if information critical to their competitiveness is embodied in software and hardware on their own premiscs. Thus advances in telecommunications services will occur not just within networks but at the edge as well. The time needed for such developments is often shorter than for developments in the internal network infrastructure.

The evolution of advanced services

The broad technological trends discussed above are the basis on which advanced services will evolve. Perhaps the most highly touted advanced telecommunications service is ISDN. The concept of ISDN originally developed as an outgrowth of standards development work in international bodies. It represented a combination of two of the technological trends identified above: the conversion from analog to digital networks, and the separation of the signaling channel

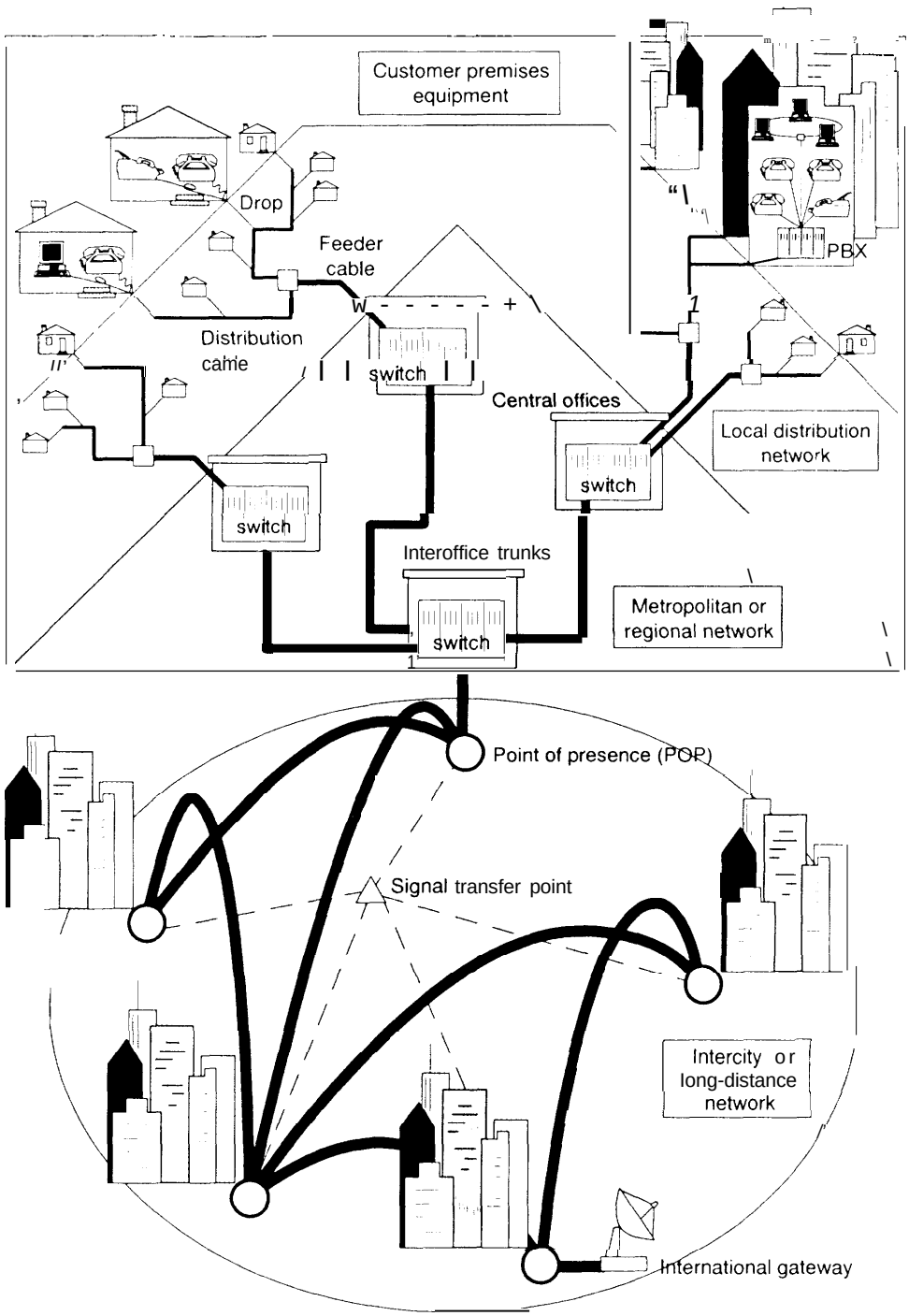


SOURCE CELLULAR TELEPHONE INDUSTRY ASSOCIATION, 1993.

Figure 2-4. Growth in U.S. Cellular Subscribership and Revenues, 1984-92

[9] In the United States, the number of f Irst-generation cordless telephones grew from 8 million in 1984 to 50 millionin 1992, and the number of cellular subscribers has grown from 100,000 to 8 million. Irwin Dorros, "Diversity, Success, and Change," *Be//core Exchange,* November/December 1992, p. 4.

Figure 2-5. A Network Topology



NOTE The publlc-switched telephone network consists of four major segments

Customer premises equipment (CPE) refers to the communications devices (including the inside wiring) in the user's home or office, such as telephones, facsimile machines, and computers and modems. The CPE of larger companies often includes private branch exchanges (PBXS) and local area (computer) networks (IANS).

Local distribution network refers to the portion of the network connecting homes and offices to the telephone company's central office.

The metropolitan or regional network consists of the central office switches and the interoffice trunk lines connecting those switches. Each central office switch corresponds roughly to a neighborhood so a city will be served by multiple central offices. Telephone traffic for points outside the metropolitan network is collected at and routed through a tandem switch.

The most obvious part of the **intercity or long-distance segment** is the web of high-capacity trunk lines (mainly fiber optic, but also microwave) that carry the telephone conversations or messages; the packet-switched data network (represented by the thin dashed line) is transparent to the user but is critical as it is the intelligence of the network—determining the best route for a call and allocating the circuits, handling billing, etc. The interexchange (or long-distance) carriers interconnect for **access** to the local network at the point of presence (POP).

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993,

from the channel carrying customer messages.

ISDN offers two primary transmission speed- 144 kbps (the Basic Rate Interface) and 1.544 Mbps (the Primary Rate Interface). The former is divided into two 64 kbps voice and data (bearer) channels plus a 16 kbps signaling channel. The Primary Rate Interface is divided into 23 voice and data 64 kbps data channels plus a 64 kbps signaling channel. These speeds are compatible with the bandwidth capabilities of twisted-pair copper cable. The bearer channels can be circuit-switched or packet-switched.

ISDN was designed to support many applications, including mutimedia communications (i.e., simultaneous voice and document transmission). The National ISDN Users Forum identified 16 important applications for ISDN: [10]

1. high-speed file exchange,
2. videoconferencing,
3. data conferencing,
4. multipoint screen sharing,
5. customer service call handling,
6. telephone/workstation integration,
7. image Communicant ions,
8. remote terminal access to LANs,
9. automatic number ID/calling linc ID,
10. at-home agents,
11. multidocument image storage and retrieval,
12. multiple ISDN phones on a single ISDN basic rate interface loop,
13. transparent feature operation between ISDN,
14. frame relay support,
15. centralized fax server with ISDN access, and
16. engineering workstation interface to ISDN.

	Percent of networks converted	Target date	Percent of networks now ISDN capable (1 991)
Belgium	800/0	1992	20%
Denmark	100	1992	0
France	100	1991	100
Germany	100	1993	60
Ireland	80	1993	0
Italy		"late 1990s"	0
Netherlands	100	1995	0
Portugal	100	1994	0
Spain		"late 1990s"	0
United Kingdom	100	1992	60

SOURCE THE YANKEE GROUP, AND COMMISSION OF THE EUROPEAN COMMUNITIES, 1992

Table **2-1.** *National ISDN Status and Goals*

In In 1990 the Federal Communications" Commission (FCC) required Bell operating companies (BOCS) to include plans for ISDN in their open network architecture plans. [11] According to these plans, the seven BOCs expect to convert over 2,000 of their 9,000 switches by 1994, making over half of their regional access lines ISDN capable.

Some European countries arc much further along. (See table 2-1.) The ISDN

[10] John D. Hunter and William W. Ellington, "ISDN: A Customer Perspective," */EEE Communications Magazine*, August 1992, p. 21.

[11] The FCC's Computer III decision required that Bell Operating Companies provide their competitors Comparably Efficient Interconnect Ion (CEI) through an open network architecture acceptable to the FCC.

[12] Bellcore data reported in *ComputerWorld*, *Nov.* 9, 1992. There are large differences in the regional Bell operating companies' plans—from 21 percent of access lines for Southwestern Bell to 87 percent for Bell Atlantic, About 30,000 ISDN-equipped lines are now in use in the area served by Bell Atlantic. General Industry acceptance of a national ISDN-1 standard was shown with a multivendor 22-node ISDN network demonstrated in November 1992.

concept evolved largely outside the United States and was identified with European Postal, Telephone, and Telegraph (administration) (PTTs). It was adopted by the International Telecommunications Union's Consultative Committee for International Telephone and Telegraph (CCITT) in 1972, and was intended as the response of PTI's to the growing demand for data communications. It assumed a unitary ''solution' in a monopoly environment.

In the United States there may now be more critics than advocates of ISDN. ISDN has not lived up to early expectations. Its slow growth has been attributed to a number of factors, including lack of user input in its design, slow development of ISDN standards, the high cost of terminal equipment, and competition from newer technologies. Widespread acceptance of ISDN may have lagged so far that other advanced technologies based on fiber optics and fast packet-switching will further limit the appeal of ISDN. AT&T officials point out, however, that these alternative technologies will benefit only big corporations, and the lack of ISDN severely limits the services that can be offered for middle-sized and small businesses, as well as for residences.

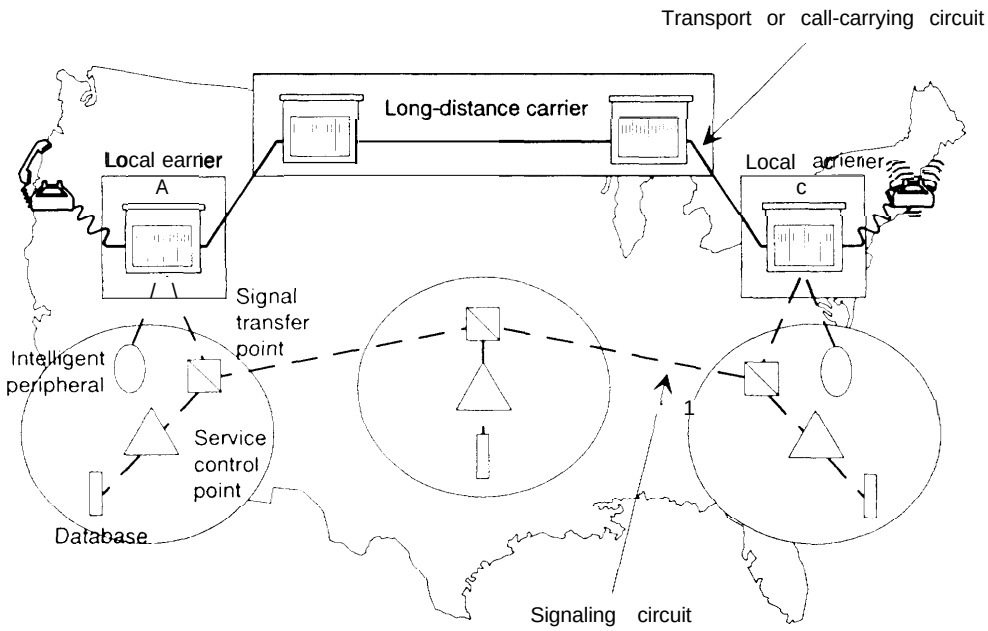
Programmable networks open the opportunity to customize them to meet customers' needs, either by carriers, third parties, or (corporate) customers themselves.

On the positive side, France and Germany arc heavily committed to ISDN and the European community is pushing it as a means toward an integrated European network. There is now a greatly increased demand for data services, and according to the International Telecommunications Users Group (INTUG), which is not a strong advocate of ISDN, interconnection between most of the various European ISDN systems has now been substantial y achieved. [13] However, ISDN may not increase PTT revenues because it sometimes replaces higher revenue services.

The ISDN outcome could possibly affect the pattern of suppliers of equipment in international networks. ISDN is part of the European pattern of centralized network intelligence, whereas the U.S. trend is to diffuse intelligence (i.e., computer logic) throughout the network, making it effectively a web of computers. The former strategy will encourage European telecommunications companies to stick with their traditional equipment suppliers; the latter strategy could benefit U.S. firms such as IBM. On the other hand, long-lived ISDN centralized switching and processing installations would, in the long run, work against small new firms with rapidly changing technologies, many of which arc U.S. firms.

A second category of emerging services are those based on the ''intelligent network concept described above, The intelligent network allows network switching elements to interrogate remote processors and databases to determine how to route a call, Making the network programmable in this way opens up the opportunity to customize it to meet the needs of individual customers, whether this is done by the carrier, by a third part y on behalf of the customer or customers, or by a (corporate) customer alone. This was the basis for ' '800' service--when a customer dials an 800 number, the call is briefly suspended while a remote database is consulted via the signaling network. In the

[13] INTUG News (July 1992) reviews the status of European ISDN based on two reports: *ISDN: 7-he Illusory Ho/y Grail*, by The Yankee Group Europe (The Old Free School, George Street, Watford WD1 813X, United Kingdom), and *ISDN Communications in Western Europe 1992*, by CIT Research Ltd. (23 Dering Street, London WI R 9AA).



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

Figure 2-6.
Intelligent Network

NOTE The advancedintelligent network (AI N), elements of which are currently installedin today's public-switched telephone network, envisions greatly increased operating efficiency as well as a broad array of *sophisticated* network services by separat ing the call t ran sport (i e., t he voice circuit) function from the signaling and control function and employing the powerful software in the switches.

Imagine, for example, an instance where a caller places a call to a fam ily member who while on vacation has indicated that calls from certain numbers are to be rerouted to the new location and given a unique nng to Indicate priority In this illustration, the vacationer would have preprogrammed the pnonty telephone numbers (other calls m ight be routed to an answering service or machine) and the new destination number by dialinginto the Intelligent peripheral and inputting these data When the caller dials the number, the local switchqueries the signal transfer point for billing and accounting information and ascertains from the service control point a clear path through the local network to the point of presence of the caller's long-distance earner of choice The signaling networks of the two local exchange companies and the long distance carrier interact to learn the status of the called party and thus how to set the call up, inthis case, the call has been red irected to a telephone address in a new location so a third local company is Involved and once again the status of the called party is learned (for example, if the line were in use, the network would direct local carrier A to transmit a busy signal to the caller) and establishes a calling path Local carrier C is also Instructed to deliver the special nng

database, the 800 number is translated into a regular telephone number, which is sent back to the switch where the call was intercepted, and the call is then handled as a regular circuit-switched call. It can be routed differently depending on the place it originated, the time of day, or other variables. Intelligent networks can route calls automatically to a customer location nearest the caller (for example, from a chain of retail stores or pizza parlors) and could take into account the closing hours of the stores and the time at which the call is made.

Another usc of the intelligent network concept is the creation of Virtual Private Network (VPN) services. One of the advantages of a real private network is that corporate customers can employ their own numbering plans, using fewer digits than required by a public-switched network because the private network serves a limited number of locations and telephones. An inelligent public network can emulate that feature on VPNs, translating a 7-digit number dialed on a VPN into a normal 10-digit number, and muting it accordingly. Another feature of private networks is the ability to restrict calling from certain telephones to reduce toll calling abuse (e.g., to prevent employees from making unauthorized international calls). The same type of restriction can be imposed by an intelligcnt public network by examining the calling and called numbers. Other features possible on VPNs include, for example, alternative destination routing, account codes for cost allocation purposes, management reports, hot lincs, and call forwarding. VPN (and new tariffs for high volumc traffic) may already have swung the balance for large corporations away from

developing private networks and back toward reliance on public networks.[14]

VPN services are not limited to voice communications; AT&T offers an international Software Defined Data Network in about 20 countries. Intelligent networks will be crucial to the development of Personal Communications Services or Personal Number Calling, which will require use of data concerning user identity, completion preferences among available alternative networks, user-selected features, and billing procedures. [15]

First-generation cordless telephones and cellular mobile radio systems are now widely available in most parts of the world. The United States has lagged behind Europe in development of cordless telephone standards. Here, the first-generation of analog cordless phones operated on a few channels, near 50 MHz in the radio spectrum. Some manufacturers have recently introduced digital cordless telephones that operate in a band in the 900 MHz region that is set aside for low power, unlicensed devices. U.S. cellular service providers are beginning to convert their first generation systems (operating in the 800 MHz region) from analog to digital transmission. The FCC is expected to reallocate a substantial block of spectrum near 2 GHz for PCS.

In Europe, two second-generation cordless telephone systems have already been developed, CT2 and DECT. CT2 is a low-powcr system in accord with a standard known as the Common Air Interface, that allows a single handset to be used in residential, business, and public (Telepoint) applications.

There is a pan-European standard for a digital cellular system operating in the 900 MHz band, the Global System for Mobiles (GSM),[16] The GSM network will support not only ordinary speech transmission but transmission of short data messages, videotex, teletex, and facsimile .17 The Digital Cellular System, DCS1800, is another standard for a Personal Communications Network that was derived from the GSM standard, but operates in a different region of the spectrum (1800 MHz) at lower powers with smaller cells. The Europeans are also working on a third-generation mobile system known as the Universal Mobile Telecommunications System.

Satellites have proven to be especially effective in delivering one-way video services and two-way data services utilizing Very Small Aperture Terminals (VSATs). VSATs arc extensively used in the United States, but development of VSAT services in Europe lagged because of regulatory restrictions. As discussed in chapter 5 (Users' Perspectives), they may become: increasingly important in the near future.

[14] For discussion of this trend, see U.S. Congress, Off Ice of Technology Assessment, *U.S. Banks and International Telecommunications*, OTA-BP-TCT-1 00 (Washington, DC: U.S. Government Printing Office, September 1992).

[15] Irwin Dorros, "Diversity, Success, and Change," *Be//core Exchange,* November/December 1992, p. 9.

[16] It is also known as Groupe Speciale Mobile. The GSM system was scheduled to begin commercial service in several countries in mid-1 991 but was delayed for various reasons, including problems with subscriber equipment-type approvals.

17 Raymond Boult, "EuropeAwards Herself t heGSM," *Network Management Europe,* May/June 1992, p. 28.

The implications of technological change

Telecommunications networks are becoming more software-intensive and the costs Of developing networks and services is increasingly in software rather than hardware. The way in which networks and services are competitively differentiated is in the software incorporated in them. Fortunately, this plays to the strength of U.S. firms.

Telecommunications networks are increasingly software--intensive and this plays to the strength of U.S. firms.

In early generations of switching equipment, hardware and software were tightly coupled and had to come from the same vendor. This is likcly to remain the case for simple switching software, but carriers, third - party services providers, and users all will in the future have increasing ability to ‘‘program networks to meet specialized needs. Carriers can be increasingly responsive to customer needs, and decreasingly dependent on hardware manufacturers and vendors. Customization through software can help private network operators, such as financial services providers. develop and offer innovative services and maintain a competitive edgc.

The pressure will thus grow to unbundle applications software and make basic transmission a more commodity-like product. There is likely to be more commingling of carrier-provided and customer-provided logic and databases. Both may be necessary. for example, in call-routing that is sensitive to time of day or changing recipient locations.

Internationtal traffic has traditionally been carried over national carriers’ ‘‘half circuits"; that is, circuits were provided by contractual agreement between two national monopoly’ operators. Now there is a shift toward “light carriers,” providing international service by reselling. rerouting. and reprogramming capacity leased from the traditional (’ ‘heavy”) carriers. This movement is driven by the ability to usc software to provide "least-cost global routing’ through a wide choice of carriers (although in fact none of the light carriers can yet offer "globa" service).[18]

Carriers that have residual monopoly power over basic telecommunications services will have a continued means and incentive to leverage that power into the provision of enhanced services. For example, a carrier might providc customer access to its internal logic and databases more efficiently or effectively than it would provide access to external logic and databases belonging to a competitor. This means that regulatory issues such as open network architecture and open network provision will remain important topics in the future.

As private networks also become more complex, some corporations arc contracting with carriers, value-added network operators, and other outside firms to manage their existing networks ("outsourcing"). But carriers arc also seeking help in network management, administration, and maintenance. For example, Ericsson, the Swedish telecommunications company, and Hewlett-Packard, the U.S. computer manufacturcr. recently announced a joint venture to provide telecommunications operators with network management systems. This was described as being “aimed at winning business from the growing demand among telecommunications operators to place orders outside their own companies for systems that combine net-

[18] Gregory Staple, “Winning the Global Telecommunications Market,” *Telegeography 1992* (London: International Institute of Communications, 1992).

Regulators and policymakers will find it increasingly difficult to separate regulated basic services from unregulated enhanced services.

work management with administrative and customer support systems. ' [19]

Because of the creation of services within software rather than in hardware, regulators and policy makers will find it increasingly difficult to separate regulated telecommunications services from nonregulatcd enhanced information services, or to distinguish definitively between public and private networks. Similarly, agreements reached by trade negotiators that depend on distinctions between basic and enhanced services will be difficult to implement and enforce----a- will tend to stultify innovative developments.

As networks become more software-intensive and more complex, like ' 'giant distributed computer systems,"[20] they may also find that they are increasingly vulnerable to various kinds of systems failure resulting from software and hardware defects, human error, effects of natural disasters, and hostile and criminal intrusion. The core cause of failure may be simply the inability to comprehend and manage the proliferating relationships and dependencies within extremely complex systems. In international networks, coping with these vulnerabilities will require global cooperative actions.

Standards

Issues of standards development are increasingly important in the context of U.S. competitiveness in European markets. U.S. firms engaged in international commerce want a communications infrastructure that is seamless, reliable, cost-effective, and flexible. Above all, they want transoceanic and pan-European networks that, whether public, private, hybrid, or shared, are fully interconnected and interoperable. This implies the necessity of international standards.

A standard is an agreed upon technical specification or set of specifications used in producing goods or services. ' 'Product standards' define a particular item, system, function, or service. "Process standards' define features or functions that must be the same in all versions of a product or service in order to assure their safety, reliability, or interoperability with other products or services. The latter is of paramount importance for computers and telecommunications.

Many standards develop informally or *de facto;* that is, one kind of product or services captures the market, either by being first or by winning nearly universal approval.[21] Standards may also be formally set by agreement among producers; these are called voluntary standards. Finally, standards may be mandated by governments, usually for reasons of safety, health, or environmental protection. Standards traditionally were promulgated long after a technology was invented, but recently they are often ''anticipatory —that is, they may be agreed on at an early stage of a technology's development in order to guide its design and make it attractive to a larger **market** than it would otherwise find.

19 R. van de Krol, "Ericsson Joins Hewlitt in Network Systems Venture," *Financial Times,* Dec. 11, 1992.

20 Hatfield Associates, Inc., *Advanced International Telecommunications Technologies and Services,* OTA contractor report, December 1992.

2 David Hack, "Telecommunications and Information-Systems Standardization—Is America Ready?" Congressional Research Service, CRS 87-458 SPR, May 211987. Such informal standards can be taken as a sign, Hack says, t hat "past creativit y has provided societ y with a solution which if adopted broadly and consistently can move creative efforts to a new level."

Anticipatory standards create a target toward which technology development can be directed.

While simple product standards deal with the characteristics of stand-alone devices or components, such as the 12-button keypad of a modern telephone, integrated-systcm standards deal with the structure or architecture of complex technological systems or networks. Such standards assure that one part of a system will not disallow something that is important for another part of the system. For example, Open Systems Interconnect ion is an anticipatory integrated-systems standard that may allow multiple development efforts to be integrated into a cohesive structure. [23]

Networks and interoperability

Because of the imperative of interoperability, there is a strong incentive for developing international network standards that span many national markets.[24] Telecommunications network standards were originally developed for analog, hierarchical systems where the carrier was the dominant (or only) decisionmaker and the users had, or were treated as though they had, ‘ ‘monolithic, invariant needs,"[25] In analog networks, the content of the message (e. g., whether it is voice or data) determines how it is to be treated or transmitted. Digital systems arc fundamentally different: ‘‘a bit is a bit is a bit,’ and what matters is what happens at the interface to the user’s application. With programmable or intelligent networks, as described above, control of the network may be shared between carrier and user, and flexibility becomes essential. Carriers and providers of services have a disproportionate advantage here; standards, and user participation in standards-setting, are increasingly important to assure users of full and cost-effective interconnect ion.

In the 1980s, although computer costs were dropping rapidly, telecommunications network costs were soaring because of problems of incompatibility.[26] which had to be solved one at a time with converters, translators, and gateways, and other kinds of customized connectors. In traditional methods of standards development, the cost-effectiveness of manufacturing is balanced

22 Process standards to assure interoperabilit y, compatibilit y, or modularity are especially important wit h networks, whose value to users depends not only on the products’ intrinsic qualities but on the number of others who have compatible products. The most familiar examples oft his qualit y of beneficial externally y are telephone systems, whose value to each customer is assumed to Increase with the number of subscribers it connects. (Stanley Besen, “AM vs FM: the Battle of the Bands,” *Industrial and Corporate Change, vol.* 1, No. 2, 1992,) Besen points out that the number of other users may directly effect performance, or may bring about Improvements in the supply orqualit y of com elementary goods and im prove t he quait y of after-sales service by enlarging the market.

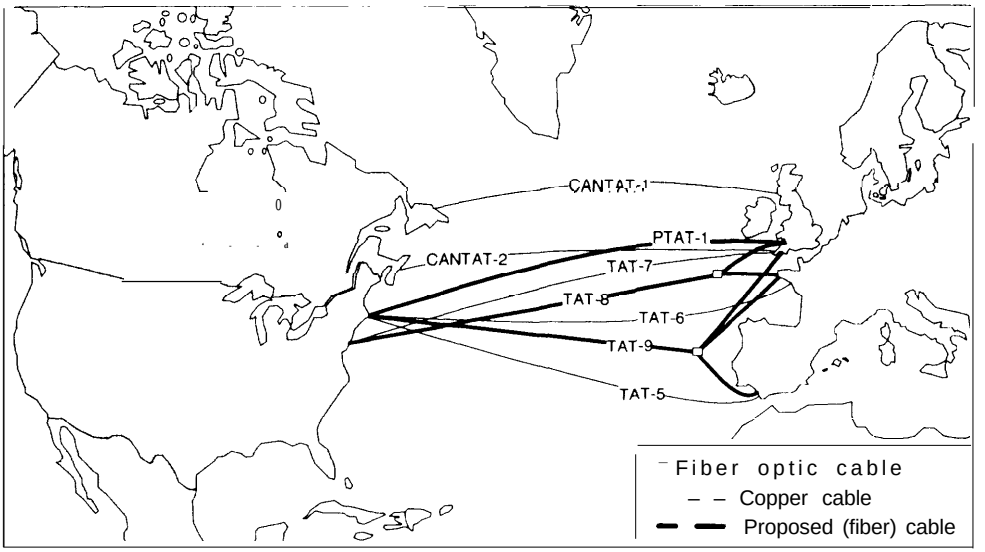
23 David Hack, op. cit., footnote 21.

[24] As used here, ‘‘international” means standards that are globally accepted, rather than standards fort he International l inks between disparate national networks.

[25] Richard Jay Solomon and Anthony M. Rutkowski, “Standards-Making for IT: Old vs. New Models,” presented at the Conference on the Economic Dimension of Standards—Users and Governments in IT Standard ization,’’ sponsored by Ministry of International Trade and Industry, Ministry of Posts and Telecommunications, and Organization for Economic Cooperation and Development, Tokyo, Nov. 18, 1992.

[26] Stanley Besen, op. cit., footnote 22.

Figure 2-7. Transatlantic Communications Cables



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

against protection for consumer safety and health. Standard-setting is slow and cumbersome, and largely dominated by technology producers, with very limited participation by users. This makes it difficult for standards to respond to customers' emerging needs. For rapidly advancing telecommunications technologies, standards should also have three characteristics, according to Richard Jay Solomon and Anthony M. Rutkowski:

- *ectensibility* --the ability to incorporate evolving technology without complete replacement of components;
- *scalability* --applicability to local, regional, national, and international networks; and
- *timeliness* --synchronization with evolution of technology and markets.[27]

The U.S. process for standards development is increasingly unsatisfactory to many critics, and perhaps to most participants.[28] It is plagued with dissension and rivalry; it is cumbersome and arcane; it is dominated by a few organizations with the considerable resources and dedicated expertise necessary for sustained participation. Intellectual property issues are unresolved. The dissemination of standards is often limited by copyrights and costs. Critics say that the process, developed for reaching consensus on relatively simple and slow-changing manufacturing technologies (e.g., the number of threads on a screw) is not appropriate for advanced electronic technologies and services to meet the highly varied and continu-

27 Solomon and Rutkowski, op. cit., footnote 25.

28 Fora full description and analysis of the process and the growing dissatisfaction witht, see U.S. Congress, Office of Technology Assessment, *Global Standards: Building Blocks for the future, OTA-TCT-512* (Washington, DC: U.S. Government Printing Office, March 1992).

ally changing needs and desires of large users.

New ways of achieving interoperability

This widespread dissatisfaction. and the implementation of packet networks in the early 1970s, resulted in an effort to find a new way of assuring interoperability, by defining a generic open systems interconnection model.[29] "Open means that any two systems conforming to a reference model and its associated standards can interconnect. One such model was developed for the Department of Defense's research computer network, ARPANet, and included a suite of protocols known as Transmission Control Protocol and the Internet Protocol (TCP/IP). Another, called the Open Systems Interconnection (OSI) model, was adopted by the International Standards Organization (IS0) and the International Telecommunication Union (ITU).[30] Both define the functions that the communicating computers (as well as some of the internal network components) must perform. Both define ''protocols,' i.e., the precise stream of data bits that must traverse from one computer to another.

In each standard, the definitions of functionality and the protocols arc organized into layers. In the Department of Defense model, four layers are recognized; in the OSI model, there arc seven. Layers make it possible for different committees to work in parallel on the development of the standards. The reference model defines the layers. A layer bounds the responsibility of each committee. A well-conccivcd reference model can greatly speed up standards development.

Producers vs. users

When products conforming to different standards (including proprietary standards) must communicate with each other, devices known variously as protocol converters, translators, or gateways can sometimes be used. Such devices have limitations. Their development depends on deep understanding of both standards; they can only support features that arc implemented in both products, and they may become unworkable

2. Solomon and Rutkowski, op. cit., footnote 25.

30 The International Organization for Standardization is an Independent, specialized International agency whose members are 97 national standards-sett ing bodies. The I SO promulgates voluntary standards in all fields except elect rical and electronic engineering, where standards are promulgated by the International Electrotechnical Commission (IEC), also an independent specialized agency. Standards for interconnecting national networks are established by the International Telecommunication Union (ITU), now a specialized agency of the United Nations. In its standards-setting activities the ITU works primarily through two committees, the Consultative Committee for International Telephone and Telegraphy (CCITT) and the Consultative Committee for International Radio (CCIR). The ITU recommendations do not carry the force of law, but they are often Implemented and enforced at the national level.

The ITU, as a United Nations agency, recognizes only governments. PTTs automatically have governmental status but not the United States' American National Standards Institute (ANSI) and the Exchange Carriers' T1 committee, which are private sector organizations. The U.S. Department of State therefore picks delegates to international standards meetings, but chooses largely representatives of the telecommunications industry and some large user corporations. Critics of the voluntary standards-setting process note that the head of the State Department's Bureau of Communications and Information Policy, which makes these appointments, is a political appointee, and complain that the delegations may be politically vetted. In the ISO, which unlike the ITU is not a treaty organization, ANSI is the U.S. member-representat ive.

when one or the other of the connected devices is upgraded. (See box 2-A.)

On the other hand, either the informal triumph of one standard, or the voluntary formal acceptance by the industry of one standard, can cause nonconforming network products to suddenly lose all value. The standard that prevails may not necessarily be the best, and always some users will be left with incompatible equipment or networks. The large installed bases necessary for global networks make it particularly costly for users later to shift to newer, more technologically advanced standards. But while standards may cut off innovation at one level by mandating one path of technological development, they make it possible to put one set of problems behind and move up another path. There is always tension between uniformity and optimality, between universality and innovation. Compromises are necessary, and this may set producers against users. The challenge is to find just the right time to freeze a standard.

*Users tend to urge ear/y adoption of standards, **while** equipment producers tend to resist early adoption.*

Users, whose chief concern is with interoperability of systems, are generally eager to see the adoption of international standards so long as these do not unduly hinder the continuing evolution of technology and services. In a survey and several case studies of large-scale U.S. users of international telecommunications conducted by the Office of Technology Assessment for this assessment the need for international standards was among the points most frequently made by users. (See chapter 5, Users' Perspectives.) Telecommunications providers and equipment producers tend to agree on the need for international standards but are much more immediately and urgently concerned with the specifics of those standards. Their individual market goals often drive them to resist agreement on standards longer than is in the interest of the industry as a whole. The standards-development organizations themselves have self-aggrandizing motivations and behaviors that often frustrate, rather than advance, the development of consent to voluntary standards.

Standards and the future

Competitiveness in foreign markets is increasingly tied to standards. The European Community is now giving strong attention to standards as a fundamental mechanism for pursuing the goal of a single market, and has particularly targeted telecommunications technologies as a high priority sector for European standards development. The EC has shown itself willing and able to develop new institutions and adopt new procedures for standards development. In 1988 it created a special standards organization, the European Telecommunications Standards Institute (ETSI), which is developing approximately 300 European standards. Most will be voluntary but some will be mandatory, and these are likely to include standards aimed at assuring interconnectivity.[31]

Europe is a large market that is potentially worth large investments by U.S. firms in meeting its standards. U.S. firms active in Europe therefore have a strong incentive to participate in ETSI standards-setting, but to

31 ETSI is now studying this question, according to information supplied by Anna Snow, Trade Division, Commission of the EC, Washington, DC. See also U.S. Department of Commerce, International Trade Association, "E.C. Telecommunications," release of Oct. 1, 1991. ETSI's technical comm ittees are staffed by technical experts rather than representatives of affected industries. To accelerate their promulgation, adoption of standards will be decided not by consensus development but through weighted voting.

BOX 2-A. INTERNET STANDARDS DEVELOPMENT

ARPANet, originally sponsored in 1969 by the National Aeronautics and Space Administration (NASA) and the Department of Defense to link scientists in certain research centers, has expanded to become Internet. Internet consists of many linked regional computer networks like SuraNet, PrepNet, etc., and as many as 10,000 small networks, with an estimated 20 million users worldwide. The actual connections are often modems connected to T1 leased lines, paid for by universities, research institutions, or corporations to link themselves to a local carrier that in turn connects them with T3 "backbones" between major locations. Several government agencies, especially the Department of Defense, NASA, and the National Science Foundation, continue to be heavily involved with funding and support of Internet for the use of universities, research organizations, and government, but a number of private sector companies provide access to it for corporations and individuals, at varying costs to users.

A new form of standards-setting appears to be evolving in connection with Internet. An Internet Society has been formed as a global coalition of carriers, information services vendors, and equipment manufacturers. It includes a group called the Internet Architecture Board (IAB), whose job is to develop the series of international standards through progressive electronic discussion and standard-drafting on the network, which is open to all users at very lowcost. IAB has established a "cooperative relationship" with international bodies such as the ITU to encourage the use of Internet to enhance global telecommunications collaborate ion in standards setting.

It should be noted, however, that in part as a result of the informality and rapid, random growth celebrated by Internet enthusiasts, access to and use of Internet remain complicated and obscure to many potential users and there are few "road maps" to the system.

The growth of Internet has given rise to a great many policy issues related to its commercialization and the role of government in its future. Many proponents of Internet, especially its earliest users in universities and research centers, have resisted any hint of government regulation; hence many issues such as universal service, privacy and intellectual property rights are unresolved even as Internet approaches the status of a major public utility.

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

do so they must have a European presence. This is a powerful incentive for them to develop joint ventures or other strong alliances with European firms, or find other means to establish European subsidiaries.

The U.S. process of standards development may require reform if it is to match the pace and increased effectiveness that is the aim of the EC current initiatives. This is unlikely to happen unless government policy provides leadership for, coordination of, and strong pressure on the contending factions within the private sector standards community. In international standards-setting arenas, the influence of European institutions will be increasingly strong and effective because of the support provided to, and the insistence on, communitywidc standards development by the EC Commission. This too implies closer cooperation by U.S. participants, and possibly a stronger leadership role for the Federal Government in pursuit of strong competitive policy goals.

National or regional standards can be used deliberately to create trade barriers and inhibit competition. Every nation wants its

telecommunications companies to be major players in world markets. In order to provide a strong domestic base, many nations discriminate in favor of domestic firms through procurement or by adopting a national standard that is different from that used by foreign producers, thus effective y closing their market to foreigners by raising the costs of penetrating it.[32] Some U.S. critics fear that EC members may form a solid voting block in international standards negotiations to impede the introduction of superior networking technology because it is perceived as U.S. dominated.[33]

Thus standards inevitably become the subject of trade negotiations. In the 1979 GATT Agreement on Technical Barriers to Trade, signatories agreed to refrain from using national standards to frustrate trade in products. This agreement was embodied in the U.S. Trade Agreements Act of 1979. However, since the GATT Standards Code explicitly does not apply to services or to government purchasing, European PTTs are usually exempt.

Along with a strong movement toward international standards, there are parallel and complementary movements to achieve interconnectivity and interoperability by other means. The FCC's Computer III decision required that Bell operating companies provide their competitors with "Comparably Efficient Interconnection" (CEI) and an open network architecture (ONA) acceptable to the FCC.[34] ONA means that components of the telephone system must be made available to competing suppliers on an unbundled basis so that they can be combined with the services of these suppliers in any manner desired. If components can be obtained on a bundled basis only, the interface between them is inaccessible to the competing supplier. The effect is the same as if the interface were accessible but incompatible.[35] The nature of the unbundling and identity of basic service elements are contentious issues because they affect the potential for competition. Services suppliers and telephone companies want different levels of aggregation.

The European Community has issued a directive entitled "Open Network Provision (ONP) Framework and Services."[36] It calls for open access to harmonized services across national borders. Whereas ONA is aimed at technical interfaces, ONP is aimed at institutional change, but the intent is the same: to foster the development of expanded markets with heightened competition, and allow translational companies to enjoy telecommunications and information services

32 Robert W. Crandall and Kenneth Flamm (eds.), "Overview," *Changing the Roles: Technological Change, International Competition, and Regulation in Communications* (Washington, DC: The Brookings Institution, 1989), pp. 1-10.

33 Sa'id Mosteshar, "Notes on Standard Setting: Bod ies in Telecommunicate ions," in a Report of t he Working Group on Telecommunications, information Technology, and Broadcasting, of the American Bar Association Special Task Force on EC 1992, June 29, 1990.

34 This was a condition for waiving an earlier FCC requirement that the Bell operating companies offer enhanced services only through subsidiaries.

35 Stanley M. Besen and Gart h Saloner, "The Econom ics of Telecommunication Standards," Crandall and Flamm, op. cit., footnote 32.

36 0. A/. P.: *The* Progress *Report-European Telecommunications 2,* Analysis Briefing Report Series (Cambridge, England: Analysis Publications, 1991).

without regard to national boundaries.[37] Implementation of the ONP Framework has so far been uneven.[38] Some EC membcr-states have not yet taken the first step of separating telecommunications operating functions from regulatory functions.

Expectations are, nevertheless, that in time the economies of scale made possible by ONA and ONP policies will begin to transform the market for telecommunications equipment into a commodity-type market in which goods compete more on price than on features. This in turn will make the telecommunications" services market highly competitive. However. given the global scale of the market and the importance placed by large companies on having efficient access to a broad menu of facilities and services, the likely outcome is not that many small companies will be offering highly individualized services but that small numbers of major players will provide international companies with services and Support.[39]

The U.S. opportunity to compete in Europe in developing and delivering enhanced communications and information services depends on both the increasing interoperability of U.S. and European networks, and the increased inter-operability of networks within Europe. The competitive advantage of U.S. firms in Europe however also depends on their differential ability to offer innovative, flexible, user-oriented services and technology. The challenge is to combine those imperatives.

37 Japan has a comparable initiative, called Open Network Development (ON D), aimed at limiting the dom inance of Nippon Telephone and Telegraph (NTT) by allowing access to its network to competitive operators and resellers.

38 "Update on ONP," *INTUG News* (International Telecommunications Users Group, London), January 1992, p. 12, and October 1992, p. 10.

39 Besen and Saloner, op. cit., footnote 35.

The European Market for Telecommunications Services

CHAPTER 3

The European market should grow more than the U.S. market for the next decade. . . and access for U.S. firms will increase.

THE EUROPEAN TELECOMMUNICATIONS SERVICES MARKET is ripe for profitable entry by competitive suppliers. Its growth potential is greater than that in the United States because of the present low market penetration for many services. Barriers to entry and high prices have prevented much demand from being met. A recent European Community directive has opened the door for widespread bypass of public switched networks, which will stimulate further demand for innovative applications and services.

This chapter describes the European market for basic and enhanced telecommunications services' and trends that arc changing its structure, and then summarizes available projections of its size and growth over the next 5 to 10 years. The Office of Technology Assessment (OTA) concludes that the European market for telecommunications services will grow strongly in the next decade, and that opportunities for U.S. firms in this market will greatly increase.

The European market for telecommunications services is in reality many national markets, with wildly different regulatory regimes, institutional structures, trade barriers, and infrastructure characteristics.[2] About 85 percent of the aggregate market is currently closed to competition, but technological and political events are combining to open much of the market in the next few years. Meanwhile, the market is studded like a rich plum pudding with niche business opportunities for U.S. telecommunications companies.

A comparison of the scale and scope of European business and industry with its current consumption of telecommunications services indicates that there is a powerful, underserved demand for enhanced services. With the integration of a single European market, geographical expansion and heightened competition should increase this demand, Many U.S. telecommunications firms are demonstrating that they can compete in Europe, and also strengthen the ability of other U.S. services industries to operate successfully in European markets.

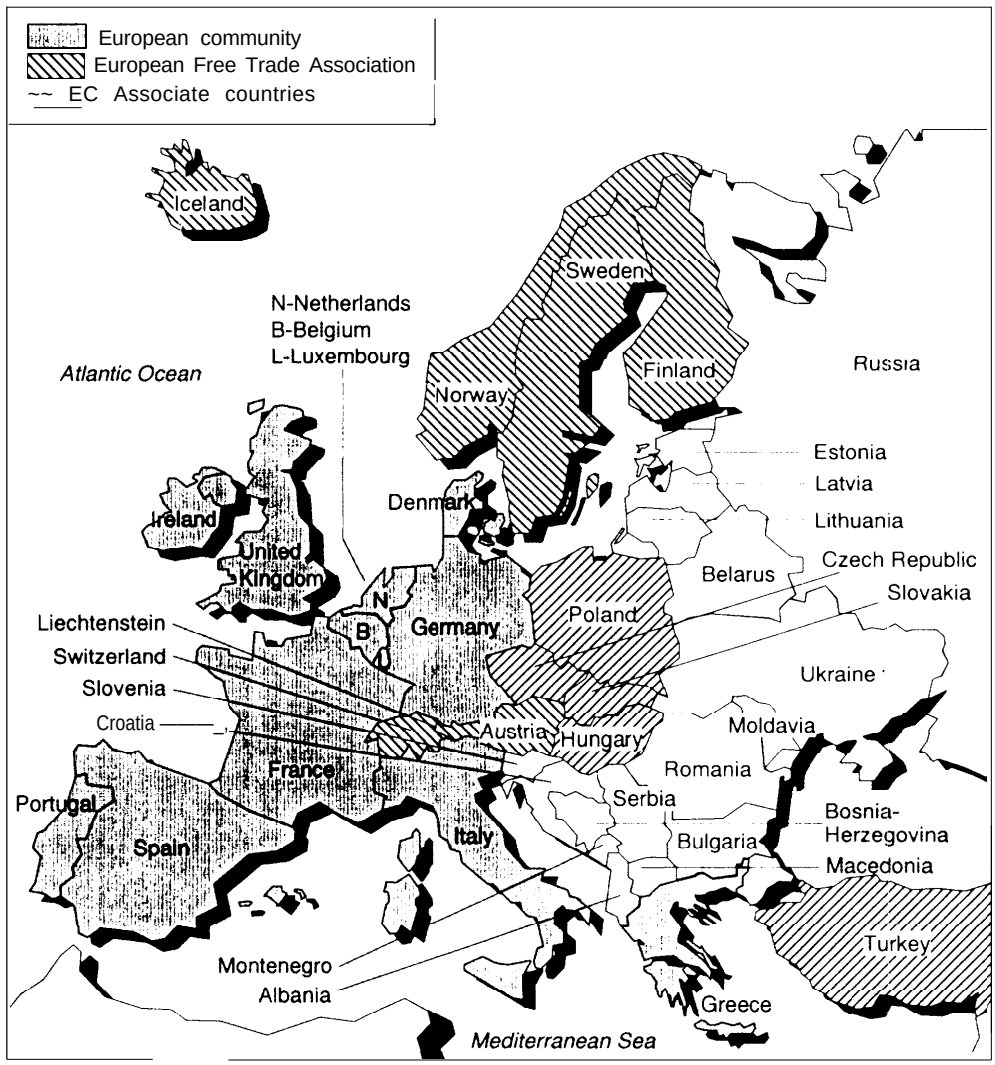
Until recently, the European market for telecommunications products and services was completely closed to entry by non-

NOTE: This chapter draws heavily on an OTA contractor report: Bruce L. Egan, "European Telecoms: A Market Assessment," Nov. 10, 1992.

[1] "Telecommunications services" is defined in this report as including all point-to-point, nonbroadcast communications transmission (basic services) and dependent or closely related information services (enhanced or value-added services). The term "value-added" is more often used in Europe and "enhanced" is more often used in the United States. The two terms are equivalent (although the services categorized as value-added or enhanced may t hem selves dfer); t hey indicate services t hat go beyond t heransmission of voice or data to in some way collect, select, format, change, process, or selectively deliver the material being communicated. This report will treat the terms as interchangeable for most purposes.

[2] The European market includes the 12 countries of the European Communit y (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, the United Kingdom), plus 7 members of the European Free Trade Association (Austria, Finland, Iceland, Liechtenstein, Norway, Sweden, and Switzerland). Together these constitute the European Economic Area for purposes of application of many of the directives of the European Communit y Commission. The countries of Central and Eastern Europe are also Included, but are treated in more detail inch. 6. However, due to data constraints, market size estimates are for the 12 EC member-states except where noted.

Figure 3-1.
Europe



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

Europeans, and in general European countries are still protectionist,[3] U.S. telecommunications markets are more open to entry by foreign firms than are the European markets,[4] yet U.S. investments and business activities appear to be much greater than the

[3] For an overview of the history of European communications and recent trends, see Eli Noam, *Telecommunications in Europe (New* York City, NY: Oxford University Press, 1992).

[4] Europeans sometimes dispute this, and can point to many remaining U.S. barriers to entry (for example, prohibition of foreign ownership of radio licenses, including nonwireless links in telecommunications networks). See ch. 1, box I-A.

combined activities and investments of European firms in U.S. markets. Successful market entry by U.S. firms has so far generally required partnering, usually with the incumbent monopoly telephone operators (public telephone operators, or PTOs).[5] The strong drive to achieve a single European Community market suggests that there will continue for some time to be powerful advantages for American firms in having a legally well-established European identity.

Foreign subsidiaries, joint ventures and alliances, and other forms of shared ownership make it difficult to measure precisely the performance of U.S. telecommunications firms overseas. It is not always easy to classify a business as U.S. or European. More importantly, there arc theoretical and practical problems in measuring trade in services, which arc usually not embedded in discrete, observable units that can be counted as they cross a border or enter a customs shed. [h]U.S. trade balance figures do not include sales of services by European subsidiaries of U.S. firms. The final section of this chaptcr, which described the current status of U.S. trade in services, must be understood as indicative rather than precise.

The structure of the European market

As a single market, the EC, with 345 million consumers, will be the world's largest consumer market. Within the EC, four countries comprise over 80 percent of the potential market in terms of gross national product (GNP) and income: the United Kingdom, France, Germany, and Italy.[7]

The United Kingdom

The United Kingdom has the most broadly liberalized telecommunications market in the world. It began partially privatizing its monopoly operator, British Telecom (BT) in 1984,[8] requiring it to face competition in domestic long-distance services from Mercury, a subsidiary)' of Cable & Wireless. The intent was to create effective competition for BT by limiting entry to one new firm and giving that new competitor some entry assistance.[9]

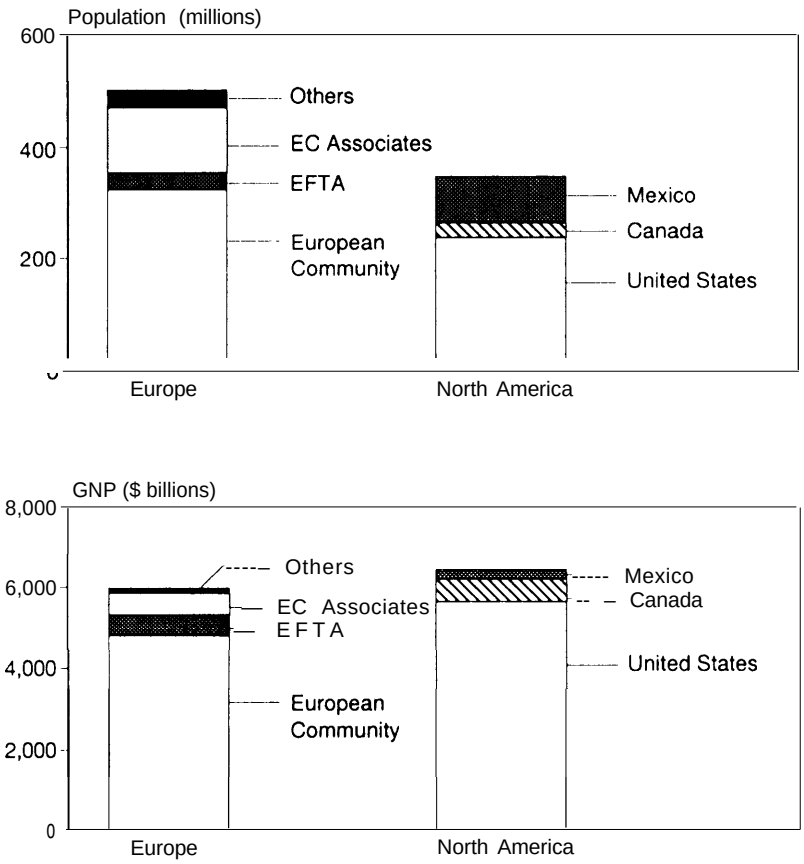
[5] Historically, the term for these organizations has been PTTs (Postal, Telephone, and Telegraph administrations). However in many cases they have been reorganized, separated, liberalized, or privatized and this term no longer fits.

[6] Anne Y. Kester (cd.), Behind *the Numbers: U.S. Trade in the World Economy,* Report of the Panel on Foreign Trade Statist ics of t he Comm ittee on Nat ional Stat istics, National Research Council (Washington, DC: National Academy Press, 1992). For a brief review of practical difficulties, see also Stephen Kindel, "Invisible Trade," *Financial World*, Oct. 13, 1992, pp. 56-59.

[7] The EC member-states together have a population of 345 m Ill Ion and GNP of S6, 157 billion. The European Free Trade Association members add another 32.5 million people and $852 billion. Turkey, Cyprus, and Malta are seeking EC membership; they have an aggregate population of 58 million and GNP of $103.7 billion. Czechoslovakia, Hungary, and Poland hold "EC Associate" status and Bulgaria and Romania are seeking it; together they add 97 million in population and S224 billion. The total population is 533 million.

[8] In 1993, the British Government is preparing to sell off its remaining 21.8 percent ownership of BT.

[9] Sir Bryan Carsberg, Director General of Telecommunications for the United Kingdom, at a sem inar at t he Center for Strategic and International Studies (CSIS), Washington, DC, Oct. 11, 1992; for proceedings see CSIS International Telecommunications Studies, Global Issues, "UK-U.S. Stakes in the International Regulatory Game," no date.



SOURCE: WORLD FACT BOOK, 1991.

Figure 3-2. *European Demographics*

In 1990 the United Kingdom moved to full open-market licensing. Each new company is to be offered some temporary entry assistance, in the form of reduced charges for interconnection with BT networks. As of February 1993, 13 new carriers have been granted licenses and 37 more applications are under consideration. These licensees and applicants propose to provide a wide range of services, with nearly a dozen companies proposing to build domestic trunk networks. (The first of these was the U.S. firm Sprint.) Several other companies plan to provide local delivery services.

The United Kingdom decided not to issue additional licenses for international facilities-based competition, because an open-door policy would require that access be granted to all reasonable newcomers, including those (like Germany) that have not opened their own market. But significant new freedoms to provide international services were introduced. These include international simple resale, for firms of countries with similar regulatory arrangements. (International simple resale is the right to sell capacity and services on leased circuits connected at both ends to public-switched networks in two countries.) (See box 3-A.) National Network, as a reseller, became the third competitor to BT and Mercury in November 1992. Another five applications are under consideration. Operators may also now provide additional satellite services, with interconnection to the public network at both ends being permitted for data traffic, and interconnection at one end permitted for voice. Eight " applications to provide such satellite services have been received to date.[11]

The United Kingdom is also fostering the establishment of cable television to provide competition in the local loop. It has licensed 20 cable networks to provide telephone service as well as TV/radio channels, al-

10 Seethe U.K. Government's 1992 White Paper, *Competition and Choice: Telecommunications Policy for the 1990s.*

11 Information provided courtesy of Mark Hammond, First Secretary for Environment, Energy, and Telecommunications, British Embassy, Washington, DC.

though customer subscriptions for the telephone connection are said to be lagging.[12] Further competition in local service was assured by licensing five nationwide cellular networks.

Since competition began, BT tariffs have been significantly lowered, including a 10 to 25 percent reduction in 1992. BT has become a strong international competitor. It plans to have its Global Network Services, with high-speed frame relay for data applications, serve 60 countries by 1994. [13]

France

In France, telecommunications traditionally was part of the responsibility of the Ministry of Posts, Telecommunications, and Space. On January 1, 1991, France Telecom became an autonomous, although completely state-owned, entity with its own budget and management. Regulatory authority was retained by the Ministry Directorate of Regulatory Affairs (DRG). France Telecom still has a monopoly in basic voice telephony and telex, but also operates competitively in some areas. Private operators may offer data transmission and wireless communications under regulated competition: i.e., they must be state-licensed. There is open competition in cellular and paging services. Private networks for closed user groups, i.e., corporate networks, must get a license from DRG, although small ones may not require licensing. Value-added services have been open to competition since 1987.

France Telecom networks are highly digitized; Integrated Services Digital Network (ISDN) services are universally available, and France Telecom's videotext services (Minitel) are famous worldwide. France Telecom has entered into many international joint ventures and alliances; it intends to be a global player, and says that 20 percent of its revenues will come from international activities by 2000.

Germany

Germany's market is the least liberalized among the larger European countries, and Germany has consistently opposed EC moves to abolish telephone monopolies, However, Deutsche Telekom, one of Europe's largest telecommunications companies, became an independent public company in 1991, when it was separated from the postal administration. The Minister of Posts and Telecommunications has announced its intention to partially privatize Deutsche Telekom by selling 49 percent of the organization's stock, in order to raise capital for the telecommunications infrastructure of East Germany. Chancellor Helmut Kohl had approved the plan in August 1992, but it was then postponed for political reasons; privatization will require the approval of two-thirds of the Parliament, and there is strong opposition from one political party and from the PTO's employees, who want to protect their civil service status. Meanwhile, the number of telephone lines in East Germany has been increased from fewer than 12 per 100 people

The United Kingdom, France, Germany, and Italy now have wide/y different regulatory strategies.

[12] *New Scientist*, July 25, 1992.

[13] "BT Expands Global Network Services Coverage," *Telcom Highlights* /international, May 20, 1992, p. 1.

[14] "Germany Defends EC Telephone Monopolies," *Telcom Highlights International*, Oct. 16, 1991, p. 4.

BOX 3-A. SIMPLE INTERNATIONAL RESALE

Customers with large international capacity requirements often lease circuits from international carriers to connect corporate offices. Since these are dedicated circuits, no switching is required. The term international simple resale refers to the ability to connect these private circuits to the public-switched networks at both ends of the international transmission,[1] and to resell spare capacity to other companies. This allows enhanced services providers to become "light carriers," leasing high-volume capacity at reduced rates and reselling it to customers, often at lower rates than primary carriers can offer (since with private lines, the light carriers avoid paying international accounting rates). The right to do this both empowers users and challenges the traditional relationships between national carriers in providing services and distributing the revenue from international calls.[2] Rules permitting international resale will enable carriers themselves to offer services on an international basis, substituting head-to-head competition between national carriers for the traditional cooperative relationship in delivering international traffic. International simple resale is being pursued in a few countries, including the United States, the United Kingdom, Canada, and Australia.

In June 1991, the U.K.'S Department of Trade and Industry (DTI) lifted restrictions on reselling capacity on domestic private leased lines, but announced that for international simple resale, it would require equivalence in regulatory treatment from the corresponding country. The DTI has identified Canada, Sweden, New Zealand, and Australia as countries with sufficiently equivalent environments for the provision of international simple resale. In

1 Resale that is not "simple" is that in which only one end, or neither end, of the private circuit is attached toapubhc-switched network.

2 International service is a cooperative effort; it was historically a "half-circuit" arrangement whereby a national carrier's jurisdiction hypothetically extended from its home domain to a midpoint on each translational circuit (either a cable or satellite channel); in this way the national carrier owned cable landings and satellite receivers in its own country. in practice the "hand-off" of an international call does not occur at the midpoint but at the international gateway of the recipient country.

in 1989, to 20.15 Germany may follow the French model, a public corporation with autonomous management, but still under state ownership.

Meanwhile, the state retains a monopoly on terrestrial networks and telephone services, but cellular communications, satellite services, and data networks services have been opened to competition. Two cellular systems have been licensed, and there arc a number of licensed private mobile radio systems for taxis, trucking companies, etc. By the mid- 1990s, the company hopes that about one-third of its revenue will be in competitive areas. ISDN is to be fully implemented during the 1990s,

In addition to the massive task of rebuilding networks in caster-n Germany, Deutsche Telekom faces other challenges: reorganizing its internal structure and expanding into international markets.[16] It has already initiated joint ventures with firms in several

15 "Deutsche Telekom Appeals for Faster Privat ization," *Telcom Highlights International,* Feb. 10, 1993, p. 2.

16 H. Ricke, chairman of the board, "Germany's TELEKOM: A New Way of Doing Business in a Liberalized Market," *Telecommunication Journal, vol.* 58, October 1991, p. 711.

International simple resale would likely lead to growth of "light carriers," who would challenge national monopolies' control of international services.

September 1992, the DTI licensed ACC Long Distance to provide the service between the United Kingdom and Canada.

In the United States, the U.S. Federal Communications Commission (FCC) ruled in December 1991 that international carriers must permit the resale of private leased line capacity, but stipulated that this rule would apply only where the foreign country permits equivalent access. Despite objections from AT&T, the FCC has permitted resale between the United States and Canada, and has authorized Fonorola and EM I Communications to offer the service.

No international simple resale is allowed directly between t he United States and the United Kingdom, despite their relatively harmonious approaches to liberalization. (Telephone rates between the two countries are relatively low compared with other international rates.) Each of the two regulatory agencies maintains that a reciprocal regulatory environment does not exist in the other country. The DTI objects to the FCC's treatment of all foreign-owned common carriers as "dominant," subjecting them to more rigorous filing requirements than some domestic carriers.[3] U.S. regulators point to rules in the United Kingdom that deny U.S. firms international facilities licenses, which U.S. rules permit to foreigners. The DTI is reserving t he right to build, operate, and own international facilities to BT and Mercury, and competitors must bargain with one or the other for leased lines for international services. The intent is to protect Mercury, whose share of the U.K. market is only about 10 percent, in an effort to assure competition for BT.

3 AT&T and all foreign carriers are subjected to more rigorous regulatory requirements (I.e., 45 days notice before filing for "Sectlon214" authorization to provide additional international services) on the grounds that because of market dominance or monopoly power they are able to restrict competition in their home markets. The FCC has proposed to modify this rule so that it will not apply to all foreign earners in regard to all services or geographical markets.

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

countries, including one to build an electronic data interchange (EDI) exchange for Europe, and one with France Telecom to offer managed networks services.

Italy

In Italy several entities provide different kinds of telecommunications services, but each has a monopoly in its own kind of services. Azienda di Stato per i Servizi Telefonici (ASST) is operated directly by the Ministry of Posts and Telecommunications, and provides trunk services between major cities. international services for Europe, and some data serv ices. Societa Italiana per l'Esercizio delle Telecommunicazioni (SIP) is the major carrier, operating the national network and providing trunk services not run by ASST. SIP also holds the concessions for mobile radio and packet-switched services, [7] The connection for all intercontinental communications services is provided by Italcable, which also provides a number of value-added services.

[7] The packet-switched service (Itapac) began in 1984, but has expanded significantly in only the last few years.

The Italian Government-through its trading corporation, the Instituto per la Ricostruzione Industrial (IRI)--owns 85 percent of the Societa Finanziaria Telefonica, which in turn owns most of the shares of SIP, Telespazio, and Italcable. The IRI group also has an research and development subsidiary, CSELT, which also serves equipment manufacturers, in order to link carrier/manufacturer research.[18] The Ministry of Posts and Telecommunications has final authority over all of the companies, in addition to operating ASST directly.

Italy expects to rationalize this complicated market structure and to introduce competition in services; it has ratified the EC Services Directives. The government policy puts high priority on increasing network penetration to 42 lines per 100 people and upgrading the infrastructure.

The EC aggregate market

The total 1992 market for EC telecommunications in terms of sales is estimated at $150 billion, of which 70 percent or $120 billion is for telecommunications services.[19] Overall market growth for EC telecommunications services for the early 1990s is expected to be about 5 to 6 percent per year.[20]

The EC also represents about 25 percent of the world market for telecommunications equipment (for comparison, North America accounts for 35 percent). It is widely reported that U.S. companies are doing well in European sales of equipment needed for private networks, such as very small aperture terminal (VSATs).[21] Sales of enhanced telecommunications and information services by U.S. firms also encourage the sale of U.S. equipment, even though some U.S. firms, such as MCI, make a point of using a mix of U.S. and foreign equipment vendors.

Growth in PTO revenues and in market penetration (access lines relative to population) is much higher in EC countries than in

[18] Italy 's telecommunicat ions equipment manufacturer, Italtel, is the fourth largest in Europe. However, all of the major European equipment manufacturers hold significant market shares in Italy. ("Research and Development in Telecommunications," *Telecommunications Policy*, January/February 1992, p. 49).

[19] All market estimates in this section are for the 12 member-states of the EC unless otherwise noted. This represents the vast preponderance of the greater Europeartelecommunicat ions market. The est i mates and projections unless otherwise noted were developed for OTA by Professor Bruce Egan, Columbia Institute for Tele-information, Columbia University School of Business, on the basis of assessment and integration of a large number of market analyses. The sources Include: McGraw-Hill and subsidiaries Northern Business Information and Datapro; Dataquest; Communications and Information Technology Research (CIT); Intelidata; Logica; Input; the Commission of the EC; Organization for Economic Cooperation an Development; North American Telecommunications Association; Observatoire Mondial des Systèmes de Communications (France); Frost and Sullivan; the Gartner Group; Link; the Yankee Group.

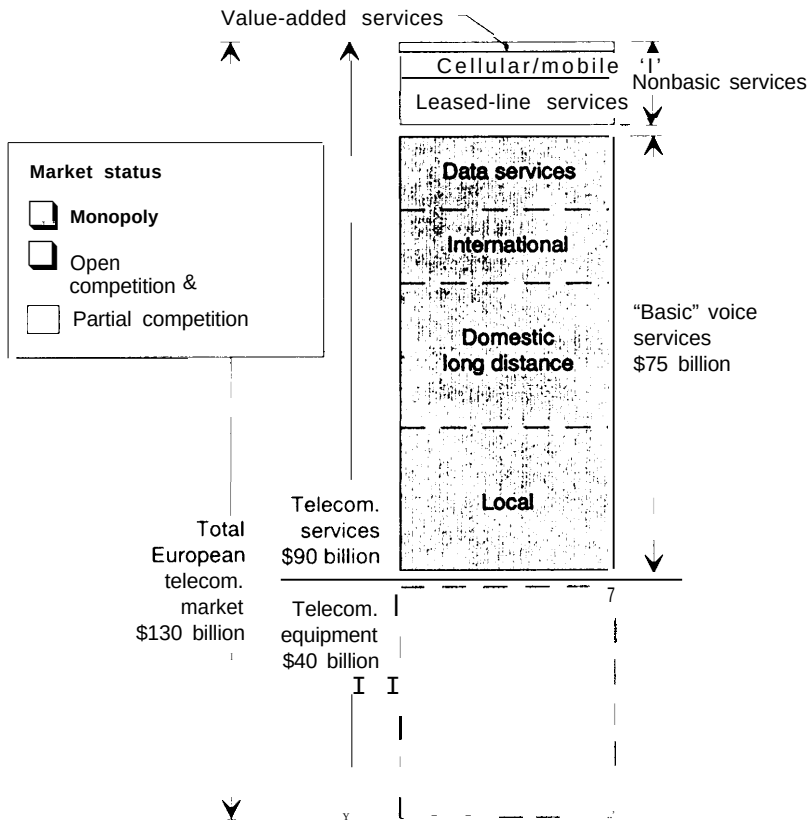
[20] Market forecasts range from 5 percent to 9 percent for services. Growth projectionsfor telecommunications equipment ranged more widely, from 3 to 10 percent but concentrated at the lower end of the range. The projected growth rates for European telecommunications services revenues are very similar to those projected for U.S. telephone company service revenues (slightly lower in real growth because inflation is slightly higher in Europe at present). Revenues of U.S. private network service providers are growing faster.

2 David Gilhooly, publisher of *Communications Week*, speaking at a seminar on International Strategies held in connection with COMNET Exposition, Washington, DC, Feb. 3, 1993.

the United States.[22] Businesses account for 26 percent of total access lines and 45 percent of PTO revenues. Total EC traffic growth for the public-switched network is about 6 percent per year. Toll call revenues are growing somewhat faster, and international toll calls arc growing fastest—l 4 percent per year. Of all international calls made in the EC in 1991, 55 percent went to other EC countries, and 11 percent to the rest of Europe.[23]? (See figure 3-3.)

In most EC countries the sole or majority owner of the monopoly PTO is the central government, although the operating entity (the PTO) has been separated from the entity exercising regulatory authority. The PTO retains a monopoly on voice services.[24] The exception is the United Kingdom, which has liberalized market entry. As a result, BT (fomerly British Telecom) is beginning to see its monopoly on local voice services eroded by cable television companies that provide two-way telephone service. Most of these are now financed by U.S. telephone companies.

In major EC countries there are a few large providers of nonvoice services: i.e., the structure of the market is oligopolist. In practice, these markets are characterized by what economists call "the dominant firm model. That is, the PTO—which has a monopoly on voice services-also dominates the major non-voice service market sector and sets the prices; the other providers arc price-followers. There may be a number



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

Figure 3-3. European Telecommunications Market

22 EC revenue growth averaged 10 percent nominally (4 percent per year in real terms) during the 1980s, whi le market penetration grew about 5 percent per year. In the United States access l ine penetration is stable, line growth is 2 to 3 percent per year, and nominal revenue growth is about 7 percent. The growth estimates are a broad average for 1980-90, and are different from some other growth estimates presented in t his chapter for a shorter, more recent time period. Commission oft he European Communi ties, "Towards Cost Orient ation and t he Adjustment oPricing St ructures—Telecommunicat ions Tariffs in t heCommunit y," Brussels, July 15, 1992, p. 8.

23 Gregory C. Staple (cd.), "TeleGeography 1992: Global Telecommunications Traffic Statistics and Commentary," International Institute of Communication, 1992, p. 86.

24 In Denmark, Finland, and possibly some other countries, although there is a national government monopoly PTO/telecommunications authority, there are also several other PTOS with regional monopolies. In Britain, one small service area has Hull Telephone Department as its monopoly PTO.

The EC ONP Directive opened the way for competitive services suppliers and business customers to bypass PTOs In spite of their legal monopoly.

of competitive regional and niche market suppliers, including resellers and third-party network management operations.

In most EC countries there arc two providers of cellular communications; i.e., the market is duopolist (as it is by regulation in the United States). In a few countries, the PTO is still the only cellular services provider for the initial analog system. But as the cellular communications markets begin to grow rapidly and new radio frequency spectrum is allocated to cellular service, the monopoly/duopoly structure is tending to give way to oligopoly, This has happened in the United Kingdom, which has the most liberal entry policies for telecommunications in the world.

The introduction of competition in the European cellular market is being speeded by agreement on a new digital standard, the Global System Mobile Communications (GSM).[25] The United States has not adopted a compatible standard, but U.S. cellular operators are aggressively pursuing European market opportunities using the GSM standard.

The structure of the telecommunications markets in Central and Eastern Europe, now undergoing radical economic and social change, is discussed in a later chapter. These countries are likely to maintain the monopoly model for switched voice, data, and even cellular services for a long time, but probably the monopoly entity will not in all cases be wholly government-owned. Foreign ownership is needed to provide capital for rebuilding infrastructure, and to attract this capital it may be necessary to guarantee investors/operators that the PTO will enjoy a monopoly for some fixed period. On the other hand, some sources of funds for infrastructure projects, such as the World Bank and the International Finance Corporation, now tend to promote private sector control in a capitalistic market environment.

Trends shaping the European telecommunications market

Over the next decade, the European market for telecommunications services will be shaped not only by technological trends, as described in chapter 2, but by demand patterns, price trends, market liberalization, and market unification.

Long-range demand patterns:

Several trends in demand for telecommunications services are discernible:

- the expansion of private networks (much less advanced in Europe than in the United States, where a counter-trend is underway);
- the popularity of communications portability;
- growing demand for multimedia services, and
- strong and growing pressure from users.

In the United States, corporate private networks using leased lines proliferated in the 1980s, as large corporations sought less expensive and more flexible ways to obtain voice and data services. Before the AT&T divestiture in 1984, 80 percent of toll usage was billed per minute of use. Private networks shifted much of this traffic away from the public-switched networks, and today less than half of all long-distance access services in the United States are purchased under

25 The acronym originally stood for "Groupe Spécial Mobile," but as use of the standard has spread, it has become more generally known by the new name.

traditional per-minute tariff rates. (''Long-distance access services' are the interconnections between local and long-distance telephone companies.) Very large corporations, especially in the financial services sector. may send over 90 percent of their traffic over dedicated lines. There is good evidence. however, that the trend toward private networks is reversing in the United States, because of the fall in voice services tariffs and the new ability of public carriers to provide "virtual private networks' (software-controlled allocation, by the public carrier, of dedicated lines to customers on demand).[26]

On the contrary, the movement toward private networks is just gathering steam in Europe. The substitution of private networks for public-switched services (''b)puss') is a result of market forces and deregulation, especially the ability legally to resell capac - ity.[27] Bypass cost U.S. telecommunications companies bill ions of dollars in lost revenue in the 1980s.[28] It is likely that the same phenomena will occur in Europe, although it is being strong] y resisted to protect the social objective of universal service .29

The EC Services Directive of 1990 called for liberalization of all telecommunications services except for switched voice service and some data sin-vices, which member-states can continue to reserve for their PTOs. The EC Open Network Provision (ONP) Directive of June 1992, however, directly mandated non-discriminatory interconnection for leased lines by 1993, with no restrictions on their use, even for voice sevices.[30] This provides an obvious bac[k] door for business customers and competitive network suppliers to bypass the PTOs' voice services in spite of their legal monopoly. ?

[26] See ch. 2. See also, U.S. Congress, Office of Technology Assessment, U.S. *Banks and International Telecommunications,* OTA-BP-TCT-1 00 (Washington, DC: U.S. Government Printing Office, September 1992),

[27] Well before t he AT&T divestit ure, after years of litigation, the FCC in 1976 recognized t he legalit y of MCI'S Execunet Service, which was a switched private line service for large users. Private networks without Interconnect Ion had been allowed before 1976. Eventually this private network capacity expanded to most U.S. cities and became available for small companies and private residences.

[28] Bruce L. Egan, "Europeans Telecoms: A Market Assessment," OTA contractor report, Nov. 10, 1992, p. 11.

[29] Universal service was built on broadly averaged subscriber rates and built-in cross subsidies that made it possible to serve all members of the society. Eli Noam, op. cit., footnote 3, and others hold that as telephone penetration rises to a high level, very large corporations are motivated to break away from the system rather than cost-share with the general body of subscribers, whose volume of use is low and who sometimes are remote and difficult to serve.

[30] The direct ive calls for EC mem ber-states to make available by 1993 five categories of standardized leased line services (two types of analog voice lines, 64 kbps digital lines, and two types of 2 Mbps digital lines), with no restrictions on Interconnect Ion or use.

[31] Some EC member-states (Spain, Belgium, Italy) appealed to the European Court of Justice hoping to overturn the Comm ission's directives on telecommunications equipment and services. However, the Comm ission has in a series of cases successfully defended its authority under Article 90 of the Treaty of Rome to issue direct ives limiting member-states' use of monopoly power. In t he most recent case, t he Court ruled that the Comm ission's abolition of special rights was not lawful in that the Commission had failed to define them precisely, but it upheld again the legality of measures intended to abolish exclusive rights to exploitation of telecom m u nications services gra nted to PTOs. "Europea n Comm ission's Powers Upheld in Telecommunications," *Telcom Highlights International*, Dec. 2, 1992, p. 2.

This “back door" will open the way for many innovative services arrangements to challenge PTO-provided services with advanced software, customer premises equipment, and information content and fomatting. American firms have the knowledge and experience to develop such innovative services, and their prospects for successful competition should grow.

Profits from software and value-added services are likely to grow in the future, while core facilities or ‘‘conduits’ become relatively less important as a source of profits. Two other factors will further drive prices for core network capacity close to commodity costs: the growing usc of wireless technology and the usc of other infrastructures as channels for telecommunications. Railroads, highways, and canals include rights-of-way that can accommodate fiber optic cable; electric power grids can provide poles, towers, and power. Sprint, the third largest U.S. long-distance carrier, has bought the right to install cable along British Waterway canals.

Pm-table communications are now the fastest-growing communications mass market. As the technology improves, their convenience becomes increasingly attractive. Demand for mobile phones is especially strong in Central and Eastern Europe because there are long waiting lists for basic telephone service, and wireless is a relatively fast and inexpensive way to satisfy this pent-up demand.

There is a large unsatisfied market for telecommunications services in Europe, where business consumption lags far behind that in the United States.

Multimedia telecommunications is the ability to combine video, audio, text and data, and also to provide interactivity between end users and the network head-end. A growing demand for multimedia telecommunications can be expected in the long-range future to meet business needs such as three dimensional computer-aided design and videoconferencing, and to provide consumers with opportunities for distance learning, shopping from home, entertainment, and transaction services. How swiftly this market demand will mature is, however, hotly debated.

There are many indicators of strong latent demand for services in the European market. Greater Europe has a larger population and income than has the United States. Yet the United States’ consumption of telecommunications services is over half of the world’s total. In 1990 the four largest EC countries together accounted for only 19 percent of world sales of telecommunications services: the United Kingdom (5.6 percent), Germany (5.1 percent), France (4,5 percent), and Italy (3.8 percent). This indicates an unsatisfied market for telecommunications in Europe.

Within the EC market, Germany has about 30 percent of the total income, compared with the United Kingdom’s 16 percent, but its telecommunications sector is smaller. There is thus especially great potential for growth in the German market, but it is one of the least liberalized. In terms of real growth in telecommunications services revenues (1985-90), both Germany at 2.6 percent and France at 2.4 percent lagged behind Spain (8.5 percent), Italy (4.9 percent). and the United Kingdom (4. 1 percent). Germany is struggling to bring the infrastructure in the eastern part of the country up to par and has indicated that this will delay the move toward telecommunications liberalization.

The United States represents about two-thirds of the world market for ‘‘nonbasic’ telephone services such as database services and cellular telephony, while the four largest EC countries together made up only 12 percent in 1990, the latest figures available.

Telephone penetration is now growing about twice as fast in the EC as in the United States.[32] In 1991 there were between 45 and 50 telephone lines per 100 population in both the United States and the larger EC countries; more in the Scandinavian countries, and man y fewer in Central and Eastern Europe (about 13).[33] The latter area is averaging 6 percent growth in telephone penetration, and this is expected to speed up substantially during the decade. The goal in these countries is 40 telephone lines per 100 population by the year 2000; this would require nearly 15 percent annual growth.

People in the United States make three times more telephone calls than people in the four largest EC countries; but calling rates are increasing faster in those countries. [34] The average annual expenditure per capita in the United States ($445) is more than twice the average for the large EC countries ($200) in spite of lower U.S. customer charges, but average growth rates for expenditures are much higher in the European countries (5 percent compared with 1.5 percent).[35]

	EC average (1 980-90)	U.S average (1984-91)
Connection charges	-39 "/0	+ 2%
Monthly line rental	+20	+15
Local call charges	+ 3	
Monthly business line		+ 8
Intracountry toll call	-29	
Intrastate toll call		-40
Interstate toll call		-72
Cumulative inflation during period	60	22

SOURCE: BRUCE EGAN, USING DATA FROM COMMISSION OF THE EUROPEAN COMMUNITIES, "TOWARDS COST ORIENTATION AND THE ADJUSTMENT OF PRICING STRUCTURES—ELECOMMUNICATIONS TARIFFS IN THE COMMUNITY," BRUSSELS, JULY 15, 1992.

Table 3-1. EC and U.S. Changes in Prices for Telecommunications Services (changes in nominal prices)

Price trends

Tariff rationalization has not yet been achieved in the EC, and there are wide differences among countries in tariffing pol - icy.[36] Prices are high compared with those in the United States and this clearly depresses demand and causes the telecommunications networks to be underutilized.[37] Table 3-1 shows relative price changes, 1980 through 1990. Given the inflation rates, the average EC tariff rates did not decline and perhaps increased in real terms, whereas in the United States they declined as much as 72 percent in

32 "Telephone penetration" Is the number of telephones per 100 people. Average annual growth from 1985 to 1990 was: the United States, 1.8 percent; Germany, 3.2 percent; France, 4.4 percent; Italy, 4.2 percent; the United Kingdom, 3.1 percent.

33 Organ ization for Economic Cooperation and Development, *Telecommunications and Information Policies: 1992/93 Community Outlook*, OECD Working Party on Telecommunications and Information Services Policies, Aug. 7, 1992, pp. 100-109.

34 Observatoire Mondial des Systèmes de Communications, op. cit., footnote 20, pp. 60-63. Calling rates per capita are growing 3.6 percent in Germany, 4 percent in Italy, and 5.5 percent in the United Kingdom, compared with 2.4 percent in the United States.

35 The OMSYC statistics are in relative agreement with OECD spending data, although reported levels are different due to differences in both base year prices and methods of calculation. Egan, op. cit., footnote 29, p. 54.

36 Commission of the European Communities, "Towards Cost Orientation and the Adjustment of Pricing Structures—Telecommunications Tariffs in the Community," Brussels, July 15, 1992.

37 Commission of the European Communities, op. cit., footnote 23, says that revenue in the EC per main line averaged, in 1990, about 630 ecus or S819, while in the United States it was over 900 ecus or about $1,200, in spite of substantially lower U.S. prices.

real terms during the shorter time period used in the table.

In 1992, the average toll call price per minute in the United States was less than $0.20. In the EC it was $0.33 for intracountry calls and about $1 for intercountry toll calls within the EC.[38] It may cost twice as much to make a call across a nearby national boundary than to call many times that distance within one country. If the EC succeeds in opening transborder communications to competition (as may result from an ongoing review of the EC Services Directive of 1990), price cutting will surely enlarge calling rates; there is evidence from AT&T and BT of the effects of aggressive price cutting on growth in usage, [39]

The average monthly rental for a 50-km voice grade leased line is reported to be more than twice the U.S. price, although the average monthly prices for PTO leased lines (voice grade) fell about 20 percent in real terms from 1980 to 1991.[40] In the EC, higher capacity circuits cost about $3,000 per month, or about three times the cost in the United States, and except in the United Kingdom, any excess capacity on them cannot be resold .41

Cost declines due to technology adoption should be roughly similar in Europe and in the United States, so most of the price differential is due to political and institutional factors. The PTO prices appear to provide heavy cross-subsidies to other services and markets. Such differences between costs and price levels indicate a large potential for competitive entry.

Market liberalization

The pace of liberalization slowed in 1992, but the EC Commission has signaled its determination that further liberalization of telecommunications services markets will occur. The Services Directive that specifically reserved switched voice services to PTOs was scheduled to be reviewed in 1993. In spite of contention within the EC, preparation for this review produced a consultative document that set out four alternatives for consideration: 1) direct regulation of intcrna-

38 Commission of the European Communities, op. cit., footnote 22.

39 In the United States there is evidence that as AT&T, the Bell operat ing companies, and BT lost market share due to market liberalizat ion, total market volumes and revenues increased substantially, as didprof its and market values. AT&T tariff rates fell by over 70 percent in real terms between 1983 and 1991 and its market share declined by 35 percent, yet AT&T revenues and profit rates held steady because of increased demand. BT toll prices have fallen and its market share has declined as competition is introduced, butt here has been substantial growth in prof its. Bruce Egan and J. Wenders, "The Cost of State Regulation: In Theory and Practice, " Columbia Institute for Tele-Information, Research Working Paper No. 443, Columbia Business School, revised, 1992, p. 26.

Whether all consumers also benefited, or benefited equally, is less clear. U.S. consumers Increased real spending on public telecommunications by 58 percent to $700 per capita per year.

40 Given Inflation rates, this implies that nominal tariff rates increased. Commission of the European Communities, op. cit., footnote 22.

41 The comparison here is for DS1 lines. The European version is 2Mb/s, with the capacity of 31 equivalent voice grade circuits (64kbps); in the United States a DS1 circuit has a capacity of 1.5Mb/s or 24 voice grade equivalent channels. Prices for DS1 service vary substantially within the EC. In the United Kingdom the average price is about 20 percent higher than the U.S. price; in France about two and a half times higher, in Germany about 11 times higher. Egan, op. cit., footnote 29, p. 59.

tional prices by the EC, 2) ending monopolies' control of cross-border interconnections, 3) opening up the entire regulated telecommunications market, and *4)* freezing the liberalization effort and maintaining the status quo.

There was opposition to further liberalization by most PTOs and in most governments.[42] In France, for example, members of Parliament declared opposition to further deregulation on the grounds that competition would led to higher prices for local calls (which have been subsidized), hurting small businesses, and because it would enable U.S. operators to penetrate the European market.[43] On the other hand, the international Users Group (INTUG) strongly advocated the second alternative, opening transborder infrastructure and voice services to competition, in advertisements and in letters to the Commission president.[44] European newspapers reported that ''almost all consumers favour far-reaching liberalisation and harmonisation"[45]—but over a period of 10 years, rather than immediately. When the EC's 6-month period for comment ended in April 1993, the EC backed away from its proposal, and instead announced that liberalization would be accomplished more gradually, between 1993 and 1998, under "a well-managed liberalization plan' to be announced in a ''new green paper' by the end of 1995.[46]

If the U.S. experience can be used to foresee likely events in Europe, the ability to bypass PTOs' services that is implicit in the ONP Directive is likely to lead to steadily increasing competition in the European market, in spite of the success in blocking EC formal procedures. While there are strong cultural, institutional, and political differences between the U.S. situation in 1976 through 1984 and Europe today, business incentives and responses arc similar and the momentum already underway points to continued erosion of monopoly protection. In international long distance, a number of entrepreneurs have begun to arbitrage asymmetrical customer charges in the United States and Europe with arrangements for code-calling and automatic call-back schemes.[47]

If the U.S. experience is any guide, bypass will /cad to increasing competition in European markets, in spite of political opposition.

[42] The newsletter of the International Telecommunications Users Group commented that". . the forces of reaction continue to dom inate. . and to retain their hold on the political levers. " "Presidents Letter, " *INTUG News,* October 1992. The United Kingdom, Denmark, and the Netherlands are reported to support proposals to open the European voice market to competition. Dawn Hayes and John Blau, "Crack in Services Market," *Communications Week International*, *Nov. 9, 1992,* p. 3.

[43] "France Hits EC Plans for Telecom Industry," *Telcom High/ighfs International*, Jan. 27, 1993, p. 3.

[44] *INTUG News,* October 1992 and January 1993, p. 3.

[45] Andrew Hill, "Brussels Considers Widening Corn petition in EC Telecoms," *Financial Times,* Mar. 10,1993, p. 1.

[46] Statement by EC Commissioner Karel van Miert on Apr. 15, 1993, reported by *Telecommunications Reports,* Apr. 19, 1993, p. 10.

[47] For example, a European subscriber calls a U.S. number; the call is not answered, but a computer in the U.S. st rips off the number of the Incoming call, automatically returns the call (at U.S. rates), and connects the caller to a desired recipient. In many of these arrangements, calls from one foreign country to another foreign country can be hubbed through the United States at U.S. rates—this gives the caller the benefit of lower rates, but Incidentally exacerbates the accounting rate problem for the United States, which is described later in this chapter.

As European countries reluctantly allow greater competition, their policies will continue to favor European firms.

European monopolies are beginning to crumble due to the pressure from the Commission for competition within the EC, pressure from the U.S. government, and the influence of the continuing general agreement on trade and tariffs (GATT') negotiations. The United Kingdom has led the way by offering permission for international resale to the firms of any country that will agree to bilateral symmetry in market access and pricing. In October 1992, it granted the first license for international simple resale to ACC Long Distance UK, which will initially sell transmission services from the United Kingdom to Australia, Canada, and Sweden, and has applied to the U.S. Federal Communications Commission (FCC) for authority to resell service to the United States.[48] The United States also requires bilateral symmetry, and neither country's regulators are yet willing to agree that symmetry exists, each pointing to restrictions on access to the other's market. (See chapter 1, box 1 -A.) In March 1993, BT's U.S. subsidiary, BT-North America, asked the FCC for authority to resell U.S. carriers' international switched and private line services, in order to put together global virtual private networks;[49] this permission would require an FCC finding of regulatory equivalence.

The domestic long-distance market may be the last segment to be liberalized in Europe.[50] As profits and subsidies from services to large businesses and from international long distance begin to shrink due to competition, monopoly profits on domestic long-distance services will become even more important.[51] If the EC succeeds in reducing intercountry toll service rates and intracountry rates do not drop, companies may route traffic via a neighboring country with lower tariffs or lease private lines.

The non-discriminatory interconnection mandated by the Commission of the EC in the ONP Directive does not go as far as the ''equal ease and convenience of access' ordered by the U.S. District Court in the AT&T divestiture. In that case the court said that there must be punctually equal access for all competitors such that users would see no difference, even to the number of digits that must be dialed. In Europe such issues as dialing parity, subscription procedures, and control of telephone numbers still must be addressed by regulators. However, as pointed out in chapter 2, advanced software and

48 John Williamson, "Competition Drives Down Global Tariffs," *Telephony*, Nov. 2, 1992, p. 24. A number of U.S. companies, called "light carriers," already provide international resale services.

49 "British Telecom Applies for U.S. Private-Line License," *Telecom Highlights International*, Mar. 17, 1993, p. 3.

50 It should be noted, however, that in both Europe and the United States basic local telephone service for residential subscribers is still effectively a monopoly, even though in the United States and in ?he United Kingdom local loop competition is legal.

51 The comparable U.S. network segment is intra-LATA long distance. (LATA stands for Local Access and Transport Area, a geographical term invented at the time of divestiture to denote the area within which a regional Bell operating company (RBOC), as a local exchange carrier, can legally provide end-to-end toll call ing service at tariffed rates.) RBOCs cannot legally provide inter-LATA toll service. LATAs vary in size; there may be one in a small state or several in a large state, but they are roughly comparable in scale to domestic long distance in a European country. Local carriers have lost over a fourt h of this market to private networks, although legally this market is reserved for the carriers.

switching systems may be able to overcome such problems as dialing parity.

In short, it appears that there will eventually be competition in nearly all telecommunications services markets in Europe, including toll voice services, not necessarily because open entry is explicitly allowed but because of the back door created by the EC ONP Directive. This may, however, take some time-possibly the rest of this decade—to become effective. It is likely to be at least that long before U.S. firms will have full or easy access to these markets. Until then, the strategy of partnering or joint ventures, as described in the next chapter, is likely to prevail.

Market unification

Even as European countries move to allow greater competition, they will continue to promote policies favoring their own domestic firms. They naturally prefer that if the dismantling of monopolies and cross-subsidy structures is to occur, it should benefit first their own and then other EC businesses before it benefits foreign businesses. The Commission of the EC appears to concede this; market unification itself is designed to develop a strong domestic market base for leverage in the international marketplace.[52] Explicit Commission support for favoring domestic firms in conjunction with EC market unification efforts was reemphasized in the Eurostrategies Report released in July 1992.[53]

The further unification of the EC market will thus enhance the competitiveness of EC firms relative to foreign suppliers. Domestic firms will benefit most directly and immediately from liberalization of regulations, from the opportunity to expand into neighboring geographic areas, and from more uniform business law and technical standards. Experience in the United States and in the United Kingdom indicates that when competition is introduced the revenues, profits, and market value of the former monopoly provider increase rather than decrease.

The EC rules for unification and free trade will apply specifically only to firms of member-states, while treatment of foreign firms will still be governed by GATT and other international conventions, as discussed in chapter 7. The prevailing U.S. strategy of partnering will continue. Joint venturing qualifies U.S. firms as European firms. In addition, firms in some of the smaller EC member-states, not themselves large enough to become strong players in an expanded market, have recently been seeking to partner with large U.S. firms. Examples arc STET (Italy) and Telefonica (Spain).

If market unification is likely to benefit at least the stronger European firms, conventional wisdom would suggest that U.S. firms might be relative losers. The perspectives of U.S. services firms operating in Europe, on the contrary,[54] suggest that **the relative** disadvantages to U.S. firms may be far outweighed by the benefits to them of greater uniformity in equipment and services, regu-

[52] See discussions in Commission of the European Communities, 1992 *Review of the Situation in the Telecommunications Services Sector,* Brussels, July 10, 1992, pp. 33-41.

53 Commission of the European Communities, *The European Telecommunications Equipment Industry—The State of Play, Issues at Stake and Proposals /or Action,* Brussels, July 15, 1992.

[54] See the extended discussion in ch. 5, "Users' Perspectives," based on interviews and contributed remarks of approximately 50 representative services firms.

lations, and institutional procedures, which will allow them to offer additional innovative services in a more cost-effective way.

Some American business people fear that once the EC Commission has consolidated its regulatory authority it could assert centralized protectionist policies of its own,[55] In view of that possibility, however slim, it is essential to make sure that there is parity in the terms of trade between U.S. and European telecommunications services markets.

Market estimates and projections

Basic services

The PTOs control about 90 percent of the European market for telecommunications services; their share is about $110 billion per year (199 I -92), with a growth rate of 6 to 7 percent. The monopoly voice services portion is, in turn, about 80 percent to 90 of total PTO revenues. Thus 85 percent of the total market is legally closed to competition at this time. Nonvoice services (including leased data lines) are growing about 10 per year. Voice services have lower growth rates.

In most European countries, because leased line interconnection is restricted and prices are high, there are relatively few private networks.[56] The growth potential for leased line services is phenomenal now that technological improvements and the EC ONP Directive will allow leased lines to become a viable substitute for switched services for large customers. Revenues from the fast-growing data and value-added services markets already constitute a higher portion of PTO revenues than do the monthly rentals for leased lines. The growth potential for leased line services should be double that for traditional switched services for the next decade, at least 10 to 15 percent per year, and may be higher. The potential effect of the ONP Directive may be gauged by looking at the United Kingdom, where there are full interconnection rights. The United Kingdom represents only 16 percent of the total EC market in terms of population and income, but has well over half of the leased lines and 90 percent of the high capacity lines (2 Mbps),

In Europe, the OPN Directive should make the market structure for private network suppliers oligopolist, not only for facilities-based leased line suppliers[57] but for resellers and other value-added services

In European countries there are relatively few private networks, the growth potential is enormous.

55 In a recent paper, Professor Eli Noam discusses the possibility of such a "power play" by the Commission: "Telecommunications Reforms at the Periphery: Role Models of Followers," draft, Columbia Institute for TeleInformation, Columbia University Business School, September 1992. The possibility may not be slim. On February 1, 1993, the new U.S. Trade Representative (Ambassador Michael Kantor) denounced the EC's Ut I lit ies Directive as containing "discriminatory procurement pract ices [t hat] prevent some of our most competitive companies from selling products such as telecommunications amd power generating equipment to government owned utilities. " As of March 22, 1993, Kantor said, the United States will prohibit the procurement of EC sourced products not covered by the GATT procurement code or other security-related agreements, and will also consider the feasibility y of withdrawing from the GATT government procurement code.

56 Organization for Econom ic Cooperation and Development, *Telecommunications and Information Policies: 1992/1993,* Pans, 1992, pp. 79-87.

57 "Facilities-based suppliers" are those firms that own and operate all or a large part of the network and equipment that they use to deliver services, or that build and lease such networks and equipments to ot her services providers.

providers. Competition may force the PTOs to offer high-capacity (45 Mbps) DS3 leased line services, not now available in Europe.

Value-added services

Value-added services[58] include applications such as electronic mail (E-mail), facsimile, database services, cellular communications, paging, high-capacity data services, EDI, transaction services (automated teller machine services, credit card authorizations, computerized reservation services. electronic funds transfer), and networked computer-aidcd design and manufacturing (CAD/CAM). ''Soft' \aluc-added services include network management and consulting, software engineering, network operations and systems support services. Local area networks (LANs), wide area networks (WANs), and metropolitan area networks (MANs) are here also lumpcd with value-added services because they are often used as the delivery mechanism for services.

The United Kingdom at present constitutes most of the market for value-added services, about 70 to 80 percent.[59] The market for Yaluc-added services is generally compctitive, and full of niche suppliers. It is possible for small innovative firms to compete successfully in these markets. However, very large firms that span a wide range of services offerings and have the capacity and geographical presence to serve large, multinational corporations may dominate the market in the long run.

Large firms that can offer multinational corporations a wide range of enhanced services may dominate the market in the long run.

Estimates of the total European value-added services market vary widely depending on how broadly the category is defined. A reasonable figure is about $5 to $6 billion for the networking, infomation, and delivery portion of the market (not including charges for private data nets, cellular, paging, and other mobile and satellite business services).[60] Annual growth estimates are generally as high as 20 to 30 percent.[61] There arc 3 million subscribers for cellular commu - nications services in the EC, making up a market estimatcd at $4.5 billion in 1990. In the United Kingdom, BT provides less than half of the cellular mobile services. but elsewhere PTOs dominate this market segment.

New wireless technology applications arc expanding rapidly; these include wide area paging, private and trunked mobile radio. mobile data transmission, GSM digital cellular communications, cordless phones. personal communications services, and satellite mobile services. The potential for market growth is very high. The United States and

[58] As here used, value-added or enhanced services are those that add value beyond pure transmission. Basic services are traditional switched services such as regulated local and toll voice services and some leased line services.

59 In many EC countries the PTO is the dominant supplier of value-added services, but tariff charges for PTO-provided network delivery are excluded from market estimates.

[60] Datapro, July 1990; CIT Research, 1992; U.S. International Trade Commission, April 1990. The U.S. International Trade Commission reported that in 1989 the EC value-added services market was S26 billion, compared with S50 billion for the United States. This, however, Included computer services and software. See *Third Followup Report on the Effects of Greater Economic Integration Within the European Community on the U. S.,* Pub. 2368, March 1991.

[61] U.S. International Trade Commission, 1991; Northern Business Information, 1990; Communications and Information Technology Research, 1992.

the United Kingdom, with relatively low prices, have market penetration of about 20 mobile phones per 1,000 population. The Nordic countries, which adopted a standard very early and have lower prices than the United States, have about 50 mobile phones per 1,000 people. Germany and France have 7 and 5, respectively; and some European countries do not yet have cellular services. This should be a high-growth market through the 1990s.[62]

Electronic data interchange (EDI) is computer-to-computer transfer of fixed-format data such as orders, invoices, payment instructions, and legal documents. This market is burgeoning in the United States. Only about 7,500 of the EC's 6 million companies were using EDI in 1992, and the market is only about $110 million, of which $65 million is in the United Kingdom. With many potential applications and the effects of public network interconnection, the market may grow at 50 percent per year for the next few years.

Two related technological developments may greatly expand the hitherto small European market for satellite communications. High-powered direct broadcast satellites will allow a large number of TV channels, including new high-definition television, to reach subscribers' small, inexpensive receiving dishes. The use of VSATs with high-powered satellites allows point-to-point data transmission where good wireline network infrastructures do not exist, as in portions of Central and Eastern Europe. The total market for satellite business services is estimated to grow from $350 million in 1991 to $1.3 billion by 2001 .[63]

The traditional public broadcasting monopolies are rapidly losing market share to new channels on satellite and cable television.[64] In the United Kingdom, much of the cable television activity is financed by U.S. firms. Cable television penetration in the United Kingdom is still only 1 percent but is growing rapidly. In France it is 3.7 percent and in Germany 31 percent; for comparison, in the United States it is 55 percent. Cable penetration is estimated to rise from 23 percent of European households in 1990 to 36 percent in 1995, with revenues increasing 300 percent by 1999 (from $4.6 billion in 1990).6s Satellite television is also expected to grow rapidly. Penetration rates are now very low—from zero in Italy to 5 percent in

[62] Organization for Economic and Cooperation and Development, 1992, op. cit. footnote 56.

[63] Communications and Information Technology Research, in "Satellite Earth Stations: New Window of Opportunity," *Financial Times*, Oct. 15, 1992, Sec. III, p. X.

[64] Between 1986 and 1990, the number of broadcast hours on European television more than doubled. Much of this growth was reruns of U.S. television programs. Strong growth (32 percent) is expected over the next decade, much of it from purchase of reruns. Until recently, most growth was in in-house productions by the monopoly (public) broadcaster. From 1985 to 1990, France's public television lost 67 percent of public viewing, Germany's 29 percent, and Italy's 41 percent. (R. Le Chain pion and P. Rasmoela, "The Positioning of Private and Public Channels in Europe," Twentieth Annual Telecommunications Policy Research Conference, Solomans, MD, Sept. 10, 1992.) But on October 31, 1992, an EC directive (which member-states are rushing to implement) setup a single EC market for television broadcasting and provided that broadcasters must reserve a majority of entertainment programming for European works. The implementation of this quota will be a significant trade policy issue.

[65] Kagan World Media, Ltd., 1991.

[66] Ireland is an exception, with 42 percent of households receiving satellite television.

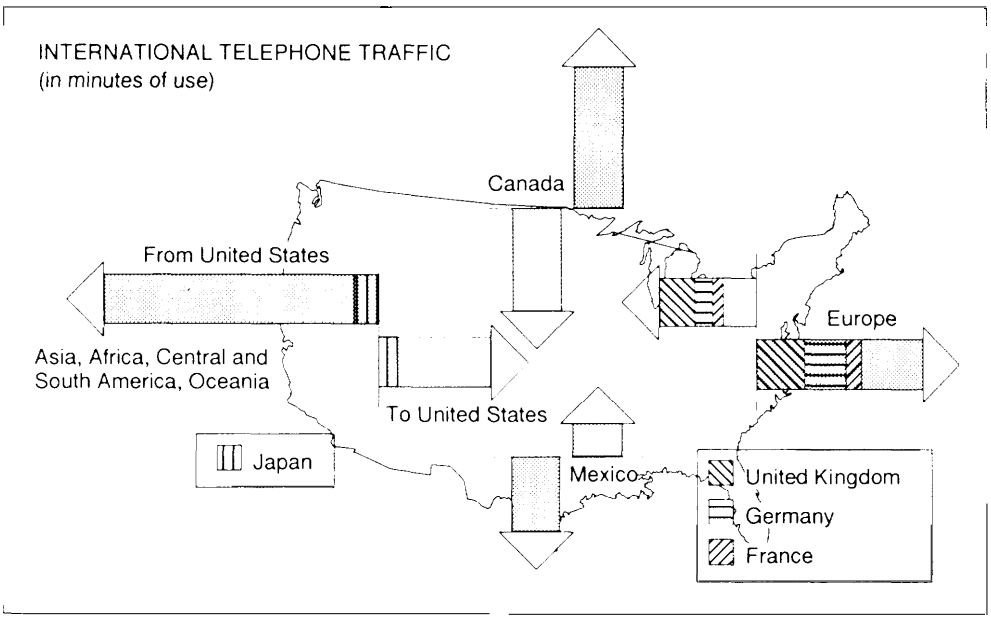


Figure 3-4. U.S. International Telephone Traffic, 1991

SOURCE FEDERAL COMMUNICATIONS COMMISSION, 1992

the United Kingdom.[66] Across Europe, penetration is expected to increase from 3 percent in 1990 (o about 16 percent by 1995.[67]

Network management systems and services is a small and fast-growing niche market estimated to grow about 40 percent per year through the early 1990s. Networked data, facsimile, E-mail, and online database services arc all expected to grow at about 20 percent per year. The United States dominates the field of on-linc database services, except for Reuters, the British/international firm specializing in financial data. The 1990 on-linc market for the United States, Europe, and Japan together was estimated in 1990 to be $10.3 billion, with the United States having 49 percent of the markct. Average annual growth for Europe was estimated at over 13 percent.[68]

The importance of U.S. trade in services

Services exports arc increasingly important to the United States economy. They arc now one-third the volume of merchandise exports, and growing briskly. U.S. services exports were $166,7 billion in 1992, 9.5 percent more than in 1991 and 41 percent more than in 1989.[69] The United States has a healthy positive trade balance in services,

[67] CARAT TV Market Forecast, 1992.

[68] Lydia Arossa, "Computerized Information Services: Economic and Trade Issues ın the Database Market," OECD DSTI/ICCP (92)6.

[69] Due to definitional and methodological changes ın data collection ın 1989, figures before and after that date are not comparable. However, ın 1988 services exports were 23 percent greater than in 1986.

$59 billion in 1992 and $52.2 billion in 1991.70 This should be compared with a merchandise trade deficit of –$ 105.3 billion in 1992 and –$73.4 billion in 1991.[71]

The European Community is the primary foreign market for U.S. service producers; almost a third of all U.S. exports of business services go to EC countries (an estimated $37.5 billion in 1991).

These figures cover only direct transactions in services and do not include revenue from sales of U.S. affiliates overseas. Such foreign investments account for about half of the total U.S. delivery of services to foreign citizens and organizations.[72] In this category, also, the United States has a favorable balance of trade, $11 billion in 1991, up from $8.5 billion in 1990.[73]

In telecommunications products and services taken together, the United States has a large trade surplus; but it has an overall deficit in telecommunications services, -$2.8 billion in 1991. This annual deficit has doubled since 1987. Why should the United States, which prides itself on being a leadcr in basic and enhanced telecommunications services, have a persistent and growing trade deficit in this sector?

The deficit in telecommunications services trade is, by a strange twist, a measure of U.S. strength in telecommunications, rather than a sign of lack of competitiveness. The telecommunications trade deficits are a result of asymmetrical traffic demand patterns and of international accounting and revenue settlement practices. When an international call is made over a public-switched network, the long-distance company in the country of origin pays the Iong-distance company in the receiving country for its services in routing the call to a customer. The amount of the payment, which is called the accounting rate, has been negotiated between the two companies. It is the same regardless of the direction of the call and is independent both of the collection rates (what the customer is charged) in either country, and of thc actual

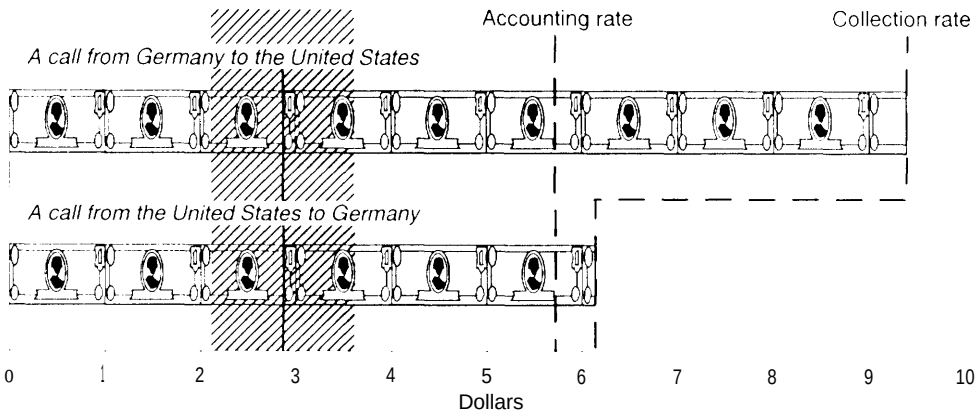
70 The total international trade in services is $700 billion (1991). The world's major services export ers are t he United States, France, Germany, the United Kingdom, and Japan. Most of the International trade in services is among the Organization for Economic Cooperation and Development countries, and these five countries together account for about 30 percent of t he OECD total. James Brian Quinn, "Technology in Services: Past Myths and Future Challenges," Bruce R. Guile and James Brian Quinn (eds.), Technology *in Services: Policies for Growth, Trade, and Employment* (Washington, DC: National Academy Press, 1988), pp. 38-44.

71 The merchandise trade deficit is often reported in newspapers as "the U.S. trade deficit," ignoring both the surplus in trade in services and other net income (direct investment receipts and payments, government receipts and payments).

72 Linda F. Powers, Deputy Assistant Secretary for Services, and Fred Elliott, Office of Service Industries, U.S. Department of Commerce, "U.S. Service Industries Face Open Quest ions," *Business America*, Feb. 24, 1992, pp. 9-10. Figures for sales to foreign persons by foreign affiliates of U.S. companies before and after 1989 are not exactly comparable because of "definitional and methodological improvements" in Bureau of Economic Analysis' 1989 Benchmark Survey. However, the proportion of crossborder transactions to the total is roughly 50 percent in 1987 and 1988 and 54 percent for 1989 and 1990; figures for 1991 are not available. Bureau of Economic Analysis, *Current Survey of Business.*

73 In crossborder transactions, travel and transportation services account for about 59 percent of U.S. exports and about 73 percent of U.S. imports, as a 5-year average, 1987-91. The second largest part of trade in services is royalties and license fees (12 percent of exports, 3 percent of imports).

A comparison of a 5-minute, peak-time call between the United States and Germany, 1991



Amount paid to the correspondent carrier to complete the call, as per the accounting rate

Amount retained by operator originating the call

Estimate of carriers' costs

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

Figure 3-5.
Accounting and Collection Rates

NOTES The accounting rate with Germany in 1992 was 0.8 special drawing rights or $1 14 (FCC, Statistics of Communications Common Carriers, 1991/1 992 Ed.).

The collection rate (i.e., what the caller is charged) for the U S.-to-Germany call is calculated as $1.77 [for the initialminute] + 4x$1 .09 = $6.13 (FCC).

The collection rate for the Germany-to-U.S call is derived from 5x$1 88 (TeleGeoraphy 1992, International Institute of Communications)

The costs to the carriers are estimated at $015 per minute at both the U S. and German end, this number is conservative.

cost to the phone company of de1ivering calls.

In one sense, the deficits represent good news; they are a side effect of lower telecommunications prices in the United States. They arc also testimony to the size and vigor of U.S. industry and its reliance on telecommunications. In the United States, customer charges for overseas calls arc much lower than in most other countries, because European countries subsidize basic services with international and business revenues; some countries also use telecommunications revenues to subsidize the postal system and public transportation. Because of lower costs and because of the size of the economy, about twice as many international calls are made from this country as arc received from overseas. Thus accounting rates cause much more money to flow out of the country than they cause to flow in.[74]

The U.S. Federal Communications Commission, the International Telecommunication Union, and the Commission of the European Communities are pressuring European telecommunications authorities to join U.S. firms in negotiating lower, cost-based accounting rates. To end the negative U.S. trade balance in telecommunications" services, however, will require not only lower accounting rates but also lower customer charges in Europe for international calls, so that the number of calls made in each direction comes into better balance.

[74] Kenneth B. Stanley, FCC, "Balance of Payments, Deficits, and Subsidies in International Communications Services: A New Challenge to Regulation," *Administrative Law Review, vol. 43,* summer 1991, pp.411 -438.

The telecommunications services trade balance will also be much improved if U.S. exports of value-added or enhanced telecommunications services grow significantly. Just as telecommunications services are a small part of all international trade in services (about 2 percent of U.S. exports and 5 to 6 percent of imports), value-added or enhanced services are a small segment of the overall market in telecommunications services. The value-added services sector is, however, likely to expand tremendously in the next decade.

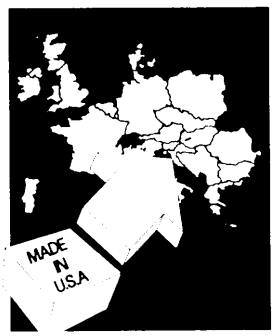
The United States had a positive trade balance of $60 million in value-added services in 1991.75 In addition, there are massive investments by U.S. telecommunications companies in Europe that are too new to show substantial profits as yet, but in the near future are likely to become very profitable ventures. Telecommunications services will probably continue to be delivered primarily through foreign-based subsidiaries. Some economists assume this because communications are infrastructure-based services,[76] but it should be noted that many telecommunications and information services can actually be delivered electronically, without regard to geographic proximity. Nontariff trade barriers are more potent reasons to establish a presence within Europe. However, U.S. subsidiaries and joint venture firms do not necessarily enjoy all of the advantages of European firms, and as the European market expands and is liberalized, direct U.S. exports of value-added telecommunications services to Europe could grow strongly.

75 Bureau of Economic Affairs, *Current Survey of Business,* September 1992, table 2.

[76] See Bruce R. Guile and James Brian Quinn, op. cit., footnote 70.

European Activities and Strategies of U.S. Telecommunications Firms

CHAPTER 4



U.S. telecommunications firms think their future growth increasingly depends on foreign markets.

AT&T CHAIRMAN ROBERT ALLEN'S BOLD GOAL of drawing 50 percent of the company revenues from overseas by 2000 reflects the strong trend for U.S. telecommunications service providers to expand their international activities (see table 4-l). The seven regional Bell holding companies (RBHCs)[1] have in the last few years also aggressively pursued international investments. It is estimated that they have invested nearly $12 billion overseas since the divestiture of the Bell Systcm, most of these investments since 1989.[2]

This trend extends to major carriers outside the United States as well. BT (formerly British Telecom) is catering to the communications needs of largc multinational firms through its Project Cyclone. Just as Sprint dropped the ' 'U. S.' from its original name, BT's name change doubtless is intended to blur the explicit association with the United Kingdom. Telefonica, the Spanish national carrier, has embarked on a series of overseas investments in South and Central America, and in Eastern Europe. ?[3]

U.S. firms are looking abroad because of new opportunities and because their future depends increasingly on growth in foreign markets. Increased spending on telephone services in the United States is expected to remain relatively small compared with increased spending on telephone service in other countries, which as described in the preceding chapter is expected to range from 30 to 80 percent.

In contrast with the European market, the U.S. telecommunications" market is saturated. There are, in the United States, several layers of providers and within each layer there arc many firms. The two largest groups arc the interexchange carriers (commonly referred to as ''IXCS' and more commonly known as long-distance carriers) and the local exchange carriers (LECs). AT&T, MCI, and Sprint dominate the long-distance business. so much so that it is easy to assume mistakenly that they arc the only three providers. In fact there are nearly 500 other firms offering long-distance services in the United States.[4] Similarly, the seven regional Bell holding companies and General Telephonc and Electronics (GTE) arc by far the largest local exchange companies. accounting for 118 million access lincs, nearly 85 percent of the 140 million telephone lines in the United States. GTE. unlikc the 's Baby Bells' is not a regional company and does not operate under the Modified Final Judgment (MFJ), the court order codifying the divestiture agrement. In addition to these eight largc firms. however. there arc some 1,300 other local "independent" telephone

[1] The seven regional Bell holding com panics (Ameritech, Bell Atlantic, Bell Sout h, NYNEX, Pacific Telesis, Southwestern Bell, and US West) are the parent companies for the 21 Bell operating companies (BOCs). NYNEX, for example, consists of two operating companies, New York Telephone and New England Telephone. While the operating companies are by far the most significant component of the holding companies' assets, NYNEX, like the six other RBHCs, also controls other nonregulated businesses such as cellular properties and a publishing arm.. (Due to several reorga nizat ions since divestiture, the number of BOCs has fluctuated. At the time of the divestiture, there were 22 BOCs; currently there are 21).

[2] Charles Mason, "Study Calls for Divestiture II," *Telephony*, Aug. 3, 1992, p. 9.

[3] Maria Bird Pico, "Telefonica Pursues Overseas Opportunities, " Telephony, Aug. 3, 1992, p. 9.

[4] U.S. Department of Commerce, 1992 *U.S. Industrial Outlook*, January 1992.

Table 4-1. Crossborder Acquisitions by Telephone Companies Worldwide

	Number	Value ($millions)
1985	5	$ 399
1986	7	132
1987	7	63
1988	11	117
1989	50	2,694
1990	67	16,539a

SOURCE: BOOZ, ALLEN & HAMILTON, AS CITED IN THE *FINANCIAL TIMES*, WORLD TELECOMMUNICATIONS SURVEY, OCT. 7, 1991, P. XXI.

a Only 2.8 percent ($463 million) of the value of cross-border transactions in 1990 are for foreign companies investing in the United States. *Financial Times,* "World Telecommunications Survey," Oct. 7, 1991, p. xxi.

companies, typically serving rural communities.[5]

Since the major long-distance companies and LECs account for most of the telecommunications revenue in the United States, these firms are also those in the best position to exploit foreign opportunities, and will be the focus of the analysis in this chapter. However, the U.S. telecommunications industry consists of many other niche players, in cellular and paging services, data networking, satellite services, and value-added information services. Many of these companies, such as Millicom and EDS, have extensive international operations.[6] There are also several telecommunications equipment manufacturers with experience in foreign markets that are using their strengths for entry into services. The two most notable cases are Motorola, with its ambitious Iridium project,[7] and IBM, which is offering data networking and value-added services in Europe. IBM recently announced its intention to add voice capability to its European Information Network through the installation of asynchronous transfer mode (ATM) switches.[8]

U.S. regulations and overseas expansion

RBHCs argue that they are prohibited from entering some of the most promising domestic markets due to the MFJ,[9] which

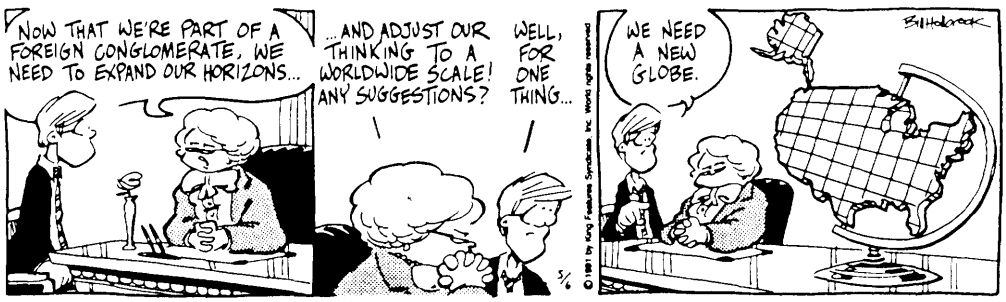
[5] These were not spawned from the former Bell System. AT&T looked first to larger, lucrative markets when consolidating its nationwide operations. Smaller communities were left to build their own telephone networks. With the help of funding from the Rural Electrification Administration of the Department of Agriculture, these independents have survived and even thrived.

[6] For example, Millicom was recently awarded one of four licenses by the United Kingdom's Department of Trade and Industry to offer telecommunications services in competition with BT and Mercury. "Telecom Sector Opens to More Competition," *Financial Times,* Aug. 12, 1992, p. 5.

[7] Motorola, a U.S. manufacturer of radio communications equipment, plans to build a constellation of 66 (originally 77) low-Earth-orbit satellites (LEOS) to relay communications to and from anywhere in the world. This project, called Iridium, is one among several competing designs for a LEOS-based communications system. Countries or communities with inadequate telephone service could benefit from global communications but be spared the cost of installing such a network. A massive project, Iridium is still in the design phase and there are many technical and regulatory issues still to be resolved. For a more complete discussion, see U.S. Congress, Office of Technology Assessment, *The 1992 World Administrative Radio* Conference: *Issues for U.S. International Spectrum Policy*, OTA-BP-TCT-76 (Washington, DC: U.S. Government Printing Office, November 1991); and U.S. Congress, Office of Technology Assessment, *The 1992 World Administrative Radio Conference: Technology and Policy Implications*, OTA-TCT-549 (Washington, DC: U.S. Government Printing Office, May 1993).

[8] John Blau, "IBM Plans Voice," *CommunicationsWeek International*, Feb. 1, 1993, p. 1.

[9] *United States v. AT&T, 552* F. Supp. at 228.



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settled the antitrust case against AT&T (see box 4-A), and certain laws, primarily the Cable Communications Policy Act of 1984. Under the MFJ, the seven RBHCs were restricted from three lines of business: inter-LATA[10] long-distance service, the manufacture of telecommunications network and customer equipment, and the provision of information services. Additionally, the consent decree originally barred RBHCs from any service that was not [b]‘ a natural monopoly service actually regulated by tariff."[11] The prohibition on information services has been lifted by the court. and several committees of the 103d Congress are working on legislation related to provisions of the MFJ.

Many analysts believe that the present regulatory structure and philosophy no longer suit the communications marketplace because advances in communications technologies arc forcing a reexamination of what services are competitive. Cable television and telephone service, for example, could with some significant modifications be provided over a single network. [13] RBHCs argue that: 1) the prohibitions preventing them from designing and manufacturing equipment unduly stifle or discourage their ability

[10] In the divestiture, the country was dividedinto 161 “local access and transport areas” (LATAs). All calls that cross a LATA boundary must be handled by one of t he compet it ive long-distance carriers, while calls within the LATA bounds (often referred to as “medium-distance calls”) do not.

[11] Modification of Final Judgment, Section II(D)(3), *United States v. AT&T, 552* F. Supp. at 228. This restriction, which effectively prevented the companies from non-telecommunications businesses, was subsequently removed at the triennial review in 1987.

[12] For one of the most provocative discussions of the increasing incompatibility between the organization of the industry and the technologies, see *The Geodesic Network //and* its antecedent report, *The Geodesic Network.* Peter W. Huber, Michael K. Kellogg, and John Thorne, *The Geodesic Network //: 1993 Report on Competition in the Telephone Industry* (Washington, DC: The Geodesic Company, 1992). Peter W. Huber, *The Geodesic Network: 1987 Report on Competition in the Telephone Industry* (Washington, DC: U.S. Department of Commerce, January 1987).

[13] In filings with the National Telecommunications and Information Administration (NTIA) for its study on Infrastructure, Dale Hatfield argued that significant variations in the transmission characteristics of voice, data, and video signals could, however, make the integration of these services over a single network inefficient and uneconom ic. National Telecommunications and Information Administration, *The NT/A /infrastructure Report: Telecommunications in the Age of Information*, U.S. Department of Commerce, October 1991, p. 229.

Box 4-A. THE MODIFIED FINAL JUDGMENT

A **consent decree entered into by the American Telephone& Telegraph company and t he Justice Department in 1982 settled a decade-long antitrust suit. AT&T was broken up into eight companies: the reorganized AT&T and seven regional holding companies. Local** service was assigned to the newly formed holding companies under certain restrictions, developed and administered by Federal District Court Judge Harold Greene. The basic premise of this divestiture settlement was that the Bell System's competitive markets should be separated from their noncompetitive monopoly markets in order to prevent unfair monopoly abuses, such as AT&T forcing captive local ratepayers to bear the burden of subsidizing equipment and long-distance service against emerging rivals. The competitive markets had begun with MCI'S challenge to AT&T's monopoly on long-distance service, starting in 1968, and the entrance of competing manufacturers of customer premise equipment.

A Modified Final Judgment (MFJ) went into effect at the beginning of 1964, clarifying and expanding the terms of the 1982 consent decree. The Bell System's 22 local telephone operating companies (BOCs) were separated from the parent company (AT&T) and grouped into seven regional Bell holding companies (RBHCs), which were entrusted with providing local services. The seven regional Bell holding companies (Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis, Southwestern Bell, and U.S. West) were specifically prohibited under the MFJ from entering the three lines of business deemed competitive and therefore assigned to AT&T: 1) designing and manufacturing telecommunications network and customer premises equipment, 2) providing information services (such as electronic yellow pages), and 3) providing long-distance service.

The information-services ban was to prevent RBHCs from using their control of the local loop "bottleneck" to engage in anticompetitive conduct toward other information-services providers. The prohibition was subsequently amended at the triennial review in 1987, and later reversed and remanded by the U.S. Court of Appeals for the District of Columbia. The other two provisions of the MFJ are the subject of intensifying congressional activity.

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993,

AT&T hopes to get 50 percent of its revenue from internatlonal activities by the end of this decade.

to properly upgrade their domestic networks, and 2) domestic line-of-business restrictions limit their options in overseas activities because foreign government ministries are wary of permitting them into areas that the foreign ministries are forbidden to enter in the U.S. market. [14]

U.S. telecommunications firms' European activities

Interexchange carriers

International telecommunications is an extension of long-distance service. AT&T delivers direct dial service to over 250 countries and territories, while MCI and Sprint connect to nearly 200 foreign destina-

[14] NYNEX, however, in discussions with the Office of Technology Assessment, noted its ability to offer cable services in the United Kingdom as a counterexample.

[15] Under Section 214 of the Communications Act, international carriers must file with the Federal Communications Commission for authorization for each connection to a foreign point.

tions (though many of these are through AT&T facilities). Each of these carriers owns a share of the capacity on the various cables traversing the Atlantic and Pacific Oceans to carry their outbound traffic, and leases Intelsat satellite capacity through Corn-Sat.

International traffic is a lucrative market, and it is experiencing high growth as commerce becomes increasingly global in nature. International traffic grew by 13 percent to 35 billion total minutes in 1991, the latest figures available.[16] Though most foreign governments continue to reserve basic voice services to a national monopoly, U.S. long-distance carriers arc making inroads into the European market for nonbasic services, such as value-added data networking. [7]

Change in the telecommunications market is often rapid, so the description that follows of the activities of the major U.S. telecommunications firms is a snapshot as of the beginning of 1993.

AT&T. AT&T is one of the few operators in the world that is vertically integrated to offer both equipment and services. No other company operates on the scale of AT&T in both segments. AT&T Chairman Robert Allen's target of 50 percent of revenues coming from international activities by the end of the decade is nevertheless ambitious.

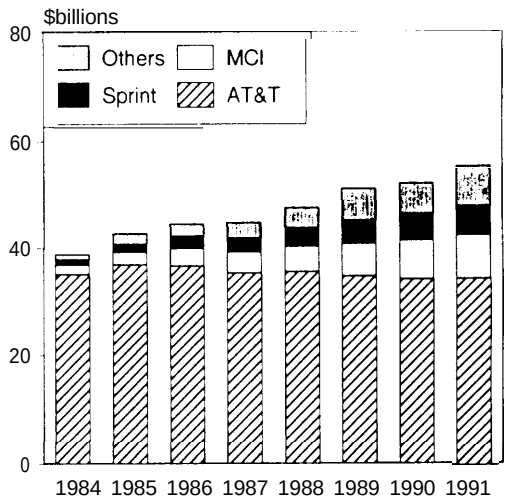


Figure 4-1. ***U.S. Toll Service Revenues,*** *1984-91*

SOURCE FEDERAL COMMUNICATIONS COMMISSION, 1993.

It means increasing the company's revenues for international equipment and services from about $12 to $90 billion and for domestic telecommunications services from $48 to $90 billion. I[8] The company purchased NCR in 1991 and Istel, a British information technology firm, in 1989. Both additions solidify its European presence: with the acquisition of NCR, which also strengthens its computer business, AT&T more than doubled its foreign workforce, most of which is in Europe.[19] Before the takeover, NCR derived approximately 62 percent of its $6 billion in annual revenues from abroad. AT&T has also expanded its stake in the

[16] "International Telephone Traffic Up 13 Percent Last Year," *Telcom Highlights International*, Sept. 30, 1992, p. 2. AT&T's traffic Increased 7.8 percent to 6.6 billion minutes; MCI grew 35.1 percent to 1.6 billion minutes, while Sprint grew 25.3 percent to 723 m Ill Ion minutes.

[17] The term "basic service" in Europe encompasses more than it does in the United States, where long-dist ance service is competitively provided. The European connotation includes t he notion of ensuring network integrit y. This becomes a contentious issue in services trade negotiations (see ch. 7).

[18] Information provided by AT&T.

[19] Prior to the purchase of NCR, AT&T employed 22,000 people outside the United States; about half of NCR's 54,000 employees are overseas. John J. Keller, "AT&T Plans to Name Tobias to Direct Overseas Lines in Bid to Speed Growth," *Wall Street Journal*, June 25, 1991.

European market for value-added services with purchases, through Istel, of service providers in other countries, such as DATAID in France.

AT&T is extending to Europe its managed data network services developed for the U.S. market, such as Clearchannel, Accunet Spectrum of Digital Services, and Accumaster Management Services. The company offers these services through separate subsidiaries in countries where competitive entry is permitted. AT&T currently has nodes in eight countries, but has plans to locate in seven others.[20] Its International Network Systems, originally started by Phillips but later bought by AT&T, is located in the Netherlands.

AT&T has a strategic alliance with the Italian local carrier, ItalTel, involving equipment sales and consulting to develop Italy's infrastructure. It has an equipment manufacturing facility in Spain, and is involved in a strategic relationship with Telefonica. The company is participating in joint ventures with the Ukraine State Committee of Communications and the Netherlands' Postal, Telephone, and Telegraph (administration) (PTT) Telecom to build and operate a modern telecommunications network in the Ukraine. The Ukraine State Committee will retain a controlling interest (51 percent), while AT&T's share in the project is 39 percent and the Netherlands PTT has the remaining 10 Percent.[21] This is the first major effort by AT&T to build an overseas network (though it has been involved with operating a cable network, CANTV, in Venezuela). The Ukraine State Committee expects to increase the penetration of phones from 7 to 22 million lines by 2000. In November 1992, AT&T purchased for $28 million an 80 percent stake in a Polish telecommunications equipment manufacturing plant, Telfa.

In May 1993, AT&T spearheaded the formation of WorldSource, a joint venture with five other operators, including Kokusai Denshin Denwa of Japan and Singapore Telecom—at the outset, the venture lacks a European partner. WorldSource will provide global voice and data communications to multinational firms .

AT&T's longdistance competitors are also among the world's fastest growing international carriers.

MCI. A relative newcomer to international communications (1983), MCI has been one of the fastest growing international carriers. MCI expanded its outgoing traffic from 103 million minutes in 1986 to 2.2 billion minutes in 199222 and has become the 6th-largest international carrier (see table 4-2), carrying 18 percent of U.S. international voice traffic. MCI international communications grew by 35 percent in 1991 and again in 1992.

In recent years, the company has made several key international acquisitions, including two international record carriers, Western Union International and RCA Global Communications. In addition, it bought Overseas Telecommunications Inc., a company involved in long-distance services in New Zealand and Australia. MCI also owns part

[20] Information provided by AT&T; see also, Robin Gareiss, "AT&T Takes on European Data Nets; Expands Outsourcing," *CommunicationsWeek*, Mar. 16, 1992, p. 5.

2."AT&T, PTT Telecom-Netherlands in Joint Venture With State Committee of Ukraine; Plan Includes Expanded International, Long Distance, Local Access Networks, Manufacturing," *Telecommunications Reports*, Jan. 20, 1992, p. 21.

22 Information provided by MCI'S Business Analysis Group, May 1993.

of Clear Communications, a competitive long-distance carrier in New Zealand.[23]

Ambitious to form global partnerships, MCI spearheaded the fomation of the Financial Network Association, an association that includes 11 other European carriers targeting communications services for international financial firms (potentially in competition with the Society for Worldwide Interbank Financial Telecommunications, SWIFT). MCI is also in a loose partnership with 23 other operators in Global Communications Services, which intends to provide ''global one-stop shopping or a full range of services to multinationals. [24]

Canada has been the most recent battleground for MCI and AT&T competition as they build their global networks. When MCI negotiated an operating agreement with Sten - tor, the consortium of Bell Canada and the provincial phone companies. AT&T responded by purchasing 20 percent of Unitel Communications, a competitive long-distance company in Canada. and filing a patent-infringement case against MCI.

In June 1993, MCI reached an agreement with BT for an alliance between the two telecommunications firms that includes the purchase by BT of 20 percent of MCI for $4.3 billion and the creation of a joint venture firm to offer global voice and data services to multinational users. BT will name three directors to MCI's board. while MCI chairman will join BT's board. MCI will invest 24.9 percent of the $1 billion to form the new venture (yet to be named). and will be responsible for marketing these global network services in North America and the Caribbean.

	Outgoing MITT[a] (millions)	Growth in MITT (1990-91)
AT&T (U. S.)	6,557	7.8%.
DBP Telekom (Germany)	3,557	13.1
France Telecom (France)	2,295	7.9
BT (UK)	2,213	1.9
Cable & Wireless (UK)	1,660	28.6
MCI (U. S.)	1,600	35.1
Swiss PTT (Switzerland)	1,429	12.5
Stentor (Canada)	1,425	6.0
Netherlands PTT (Netherlands)	1,018	12.5
ASST (Italy)	980	17.1
KDD (Japan)	850	11.3
Belgacom (Belgium)	823	12.6
Sprint (U. S.)	723	25.3
Telefonlca (Spain)	719	17.7
Swedish Telecom (Sweden)	659	7.2

a Minutes of international telecommunications traffic.

SOURCE *COMMUNICATIONS WEEK INTERNATIONAL,* SEPT. 21, 1992, P. 8.

Table 4-2. Traffic Base of Leading International Carriers

SPRINT. Like MCI, Sprint has experienced explosive growth in its share of international telephone traffic: its share of outgoing traffic increased from 43 million minutes in 1986 to 728 million minutes in 1991 (the last figures Sprint has released), having doubled its international outgoing traffic from I 990 to 1991.[25] Sprint wants to penetrate the market for intra-European long-distance service; it is involved in a project (Hermes) to build a pan-European network for voice and data. This company is the leader in international videoconferencing, with 1,200 video facilities in 30 countries. Sprint International accounts for approximately $2 billion in revenues compared with $8.8 billion for the parent company.

23 "MCI Steers Global IN," *Communications Week International*, Sept. 21, 1992, p. 1.

24 "MCI Pulling Together Global Alliances," *Communications Week International*, Sept. 21, 1992, p. 7.

25 Telephone conversation with Sprint representatives, May 1993.

Sprint has applied for a license from the Department of Trade and Industry to offer long-distance and international service in the United Kingdom. If this is approved, Sprint will team with British Waterways, which controls canal rights-of-way throughout the country, to build a fiber-optic backbone net work.

In February 1993, Sprint joined with Alcatel NV, the French manufacturer of telecommunications equipment, to form Alcatel Data Networks. The new company, of which Sprint will own 49 percent, will be headquartered in Paris with a unit in Reston, Virginia. It w ill develop and market products based on ATM technology (see chapter 2), for the data networking needs of large international business customers.[26]

Sprint has a close operating arrangement with Unisource, which is a joint venture between PTT Netherlands BV, Televerket in Sweden, and Swiss Telecom PTT that offers global network services. This arrangement, which increases Sprint's European presence, includes collaboration on global data networking and on very small aperture terminal satellite communications services, Unisource uses Sprint's European packet network and Sprintnet, its international data network.[27]

In 1988, Sprint bought Private Telecommunications Services, Inc., which owned the U.S. end of the first private transatlantic fiber-optic cable, PTAT- 1. Cable & Wireless owns the foreign portion of PTAT- 1, which connects the United States and the United Kingdom (and also lands in Ireland and Bermuda).

The long-distance carriers' strategy of expansion

The three major U.S. carriers have been actively pursuing partnerships with public telephone operators (PTOs)[28] in major European and Asian countries to handle the communications requirements of large corporate customers, who need to network with and between several countries. These consortia enable carriers to spread large capital requirements and to offer comprehensive communications packages, including consolidated billing and equipment, instead of users needing to piece together international networks. BT, with its Syncordia project,[29] has been at the forefront of this trend. More recently, BT announced its intention to

[26] *International Hera/d Tribune,* "Sprint and Alcatel Set Venture," Feb. 4, 1993.

27 Jennifer L. Schenker, "Unisource Adds Swiss," *Communications Week International*, Feb. 1,1993, p. 24. Donne Pinsky, "Sprint Targeting VSATS," *CommunicationsWeek International*, *Nov. 23,* 1992, p. 3.

28 The traditional term, Postal, Telephone, and Telegraph (Authorities) or PTTs, is in most cases no longer accurate, since the functions have been separated.

29 At the outset, Syncordia has received more attention from the press than from users or potential partners. BT originally envisioned that Syncordia (formerly called Pathfinder) would be a collaboration with NTT and Deutsches Bundespost Telekom (DBT). However, NTT and DBT balked at their respective shares in the project—BT wanted to retain 48 percent while the other partners would each have 26 percent. In addition, BT al ienated Telekom by rebuffing t he German carrier's attem pt to include France Telecom. Telekom and France Telecom then formed t heir own venture, Eunetcom. BT more recently launched Project Cyclone, an attempt to coordinate BT's various international operations, including: Syncordia for network outsourcing, Global Network Services for managed data networking, International Featurenet for international virtual net works, and Primex for international private circuit management. "BT Bolts Forward," *Communications Week International,* Sept. 7, 1992, p. 2.

purchase 20 percent of MCI and to forrn a joint venture with the second-largest American carrier (and the sixth largest global telecommunications firm), The acquisition and the venture, which will strengthen BT's presence in North America, follow directly on the he e 1s of AT&T unveiling its Worldsource partnership with Kokusai Denshin Denwa of Japan and Singapore Telecom. MCI's Financial Network Association and Sprint's Unisource consortium are other examples.

The growing leverage of the user community in telecommunications policymaking is at the center of this turbulence in the organization of international telecommunications. The rise of multinational or global companies is threatening to the national monopolies, since a single carrier will have trouble handling the communications needs of a company with headquarters or main offices in several countries. A U.S. carrier can, for example, handle a firm international needs only so long as one end of the traffic originates or terminates in the United States. Given current restrictions on network access in most countries, an American carrier is not permitted to carry the traffic of a company between, for example, Tokyo and Amsterdam. Large users are pressing for harmonious international equipment standards and service offerings; they arc also demanding that levels of service that they have come to expect at home be available abroad. They want a single firm to be able to provide for all their networking needs.

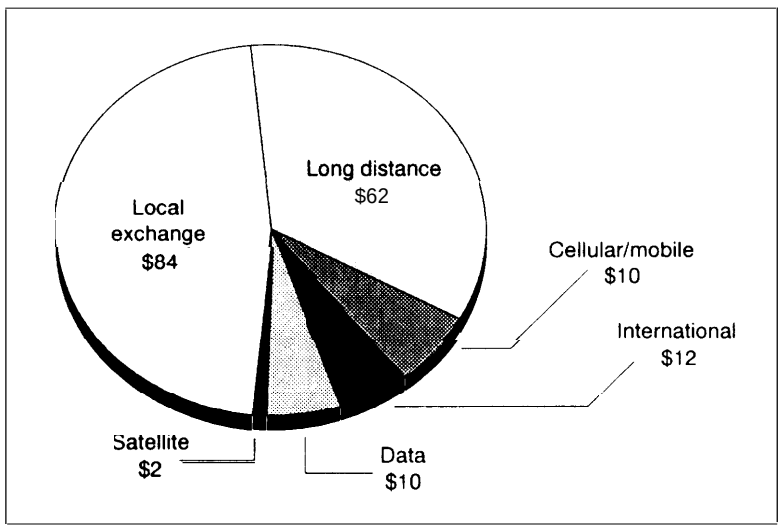
The desires of large users are often in direct conflict with the modus operandi of European PTOs, which have earned a reputation for being more responsive to politics than to customers.[30] Large corporations are accumulating the political power, both individually and collectively through groups such as the International Telecommunications Users Group (INTUG) and the International Communications Associations (ICA), to challenge the PTOs when they are dissatisfied with the quality, the variety, or the cost of services.

The rise of multinational companies threatens national telecommunications monopolies, since single carriers will have trouble operating in several countries.

A second general strategy for the world's major carriers is the development of international data networks. Again the target audience is a limited set of customers with multicountry, high-data requirements. Data communications traffic is still small relative to voice communications, but its growth is impressive. PTOs arc clinging tightly to their bread and butter, voice traffic, which may account for as much as 90 percent of the carrier's revenue and 100 percent of its profits. Data networking, therefore, appears to be a U.S. carrier's best opportunity to enter foreign markets, and each of the major U.S. carriers has a data networking subsidiary. AT&T owns Accunet and Sprint, Telnet; MCI owns 25 percent of Infonct.

Foreign carriers are following similar strategies in an effort to make headway into the U.S. market. BT purchased San Jose-

30 In particular, high international tariffs, which are important to telecommunications managers of firms with substantial international traffic, are typically used by governments to subsidize other areas, including nontelephone sectors. The international telecommunicate ions regime, pejorat ively referred to as "t he Club," manipulates this subsidy through the international accounting rates procedure, whereby the carrier in the country originating a call remunerates the carrier in the foreign country for terminating the call. The accounting rates, which in theory are intended to relate to cost, are artificially large in many cases so that the country terminating the call receives a large windfall for doing very little. (See ch. 3.)



SOURCE: 1993 INDUSTRIAL OUTLOOK, U.S. DEPARTMENT OF COMMERCE.

Figure 4-2. Estimated 1993 U.S. Telecommunlcatlons ***Services ($billions)***

based Tymnet from McDonnell-Douglas in 1989.[31] Infonet, based in California, is jointly owned by 11 European PITs, in conjunction with MCI.

Carriers are also developing virtual private networks that behave to the client like a private network. That is, the user does not pay retail rates for long-distance or international calling, benefits from abbreviated numbers, and is assured of bandwidth when needed; this is accomplished through the software in the switch rather than through discrete physical facilities. Virtual private networks relieve the user of the necessity of running, monitoring, repairing, and upgrading networks. Each of the U.S. carriers offers a virtual private network service under a trade name: MCI offers Vnet, AT&T offers GSDN (Global Switched Digital Network), and Sprint offers GVPN (Global Virtual Private Network). Foreign national carriers have similar products: BT has FeatureNet; France Telecom, Colisee; PTT Netherlands, GLOBAL; and KDD, Virnet. On an international level these require close collaboration between national carriers.

RBHCs overseas

In the last few years, the seven RBHCs have also turned their attention outward, beyond their domestic networks. The RBHCs' overseas activities have mainly taken three forms:

- The construction and/or operation of cellular networks;
- Experimentation with other infrastructure, especially cable television; and
- Investments in the privatization of state telephone companies.

U.S. companies' involvement in cellular communications has mainly occurred in Europe. In Eastern Europe RBHCs have helped construct networks that will serve as alternate infrastructure; in Western Europe, they are involved in cellular franchises competing with the incumbent carriers' operations. Their solid expertise m cellular communications in the United States[32] is valued by countries building facilities to complement or in some cases replace the existing ''wireline infrastructure. In parts

31 Under the agreement recently announced between BTand MCI, the ownership of theTymnet data network will transfer to MCI, which will purchase Tymnet's parent, BT North America.

32 The United States accounts for roughly half of the worldwide subscribers for cellular services. AfterMcCaw and GTE, the independent telephone giant, the seven RBHCs have the next largest cellular franchises. The Federal Communications Commission, in 1983, automatically awarded the local telephone provider one of the two franchises in each metropolitan service area. See Cellular Telecommunications Industry Association, *State of the Cellular Industry,* Washington, DC, 1992.

of Eastern Europe, the existing communications network cannot accommodate the burgeoning commerce. A cellular network, though requiring large upfront capital costs, is faster than repairing or modernizing the existing network. Because the demand for reliable communications is so critical, cellular operators are commanding high installation, equipment, and usage charges to cover this high investment.

RBHCs are also joining in consortia for the second or third licenses for cellular service in Western Europe, typically in competition with the PTO. Differences in the technologies of mobile communications potentially permit the survival of several competing providers. GSM, the European standard for digital cellular communications, is replacing analog cellular: some providers arc betting that personal communications networks (PCN) or personal communications services (PCS) represent the next evolution.

The second large area of activity that several RBHCs arc pursuing is franchises for cable television.[33] These are expected to be highly profitable ventures that also represent opportunisties for RBHCs to build infrastructure and establish a local presence in anticipation of EC-mandated liberalization of telecommunications markets. The United Kingdom's competition strategy permits a fertile testbed for RBHCs to experiment with video (i.e., TV) and voice over the same network. RBHCs also are gaining experience in a market they are vigorously trying to enter in the United States; the ventures abroad provide technical experience and potentially political leverage. NYNEX and U.S. West in particular are pursuing this opportunity aggressively .x4

Investments in the privatization of telephone companies have mostly taken place outside Europe, in Central and Latin America and in the Pacific Rim (notably Australia and New Zealand). The European telecommunications operators are generally financially and technically secure enough that they do not require large infusions of foreign capital and operating expertise.

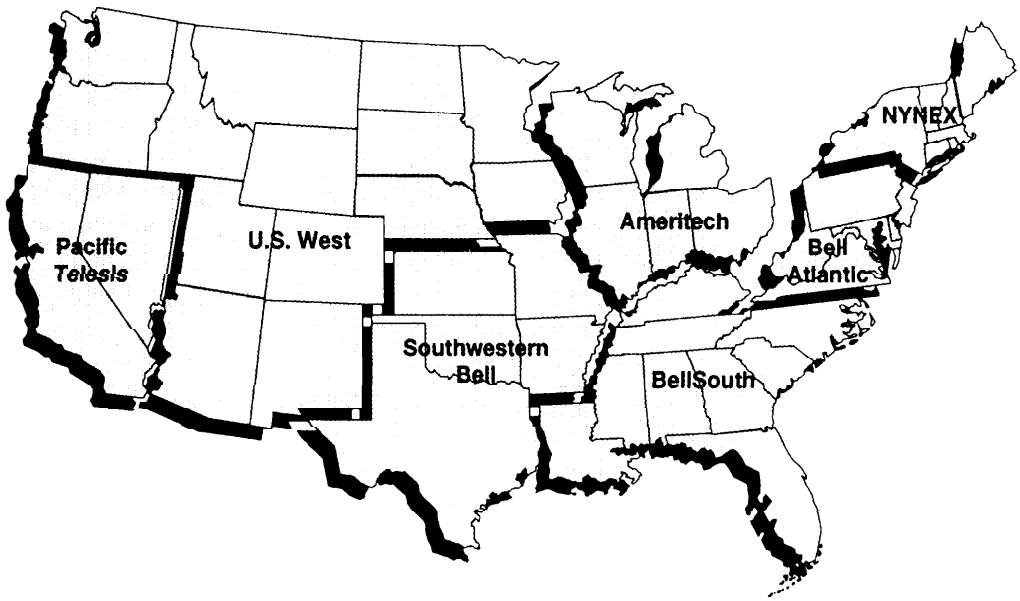
There are strong similarities in the activities of RBHCs abroad, but their intentions and strategies are not always identical. They arc referred to as one group here for the sake of convenience and because they are often allies in support of major legislative actions—they all have an interest in removal of the MFJ restrictions that limit their business activities. Since they were split from AT&T, however, they have formed markedly independent corporate strategies.

The opportunity to build *cable television systems abroad offers a testbed for* ***U.S. carriers eager to enter that market at home.***

33 Meanwhile, foreign ownership of cable franchises in the United States is a sensitive political issue. In the 102d Congress, a House version of the cable (re)regulation bill Included a provision to limit foreign ownership of these systems, similar (in theory and in degree) to the foreign ownership limitations on telephone companies and broadcasters. (Section 310 of the Communications Act limits foreign ownership of radio licenses—as may be used in microwave communications or radio and TV broadcasting—to 20 percent.) Though this section of the bill was eventually dropped, Rep. Edward Markey, chair of the Subcommittee on Telecommunications and Finance of the House Committee on Energy and Commerce, argued for the provision on national security grounds-noting the cable industry's connection to the country's "telecommunications nervous system." "Regulation Foes Plan Barrage as Conferees Approve Bill," *Congressional Quarterly*, Sept. 12, 1992, pp. 2706-2707.

[34] The great success of cable television in the United States may not necessarily be duplicated in other countries. Several European PTOs have staked their future on other technologies, such as direct broadcast satellite (DBS).

Figure 4-3. Regions of the Seven RBHCs



SOURCE: OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

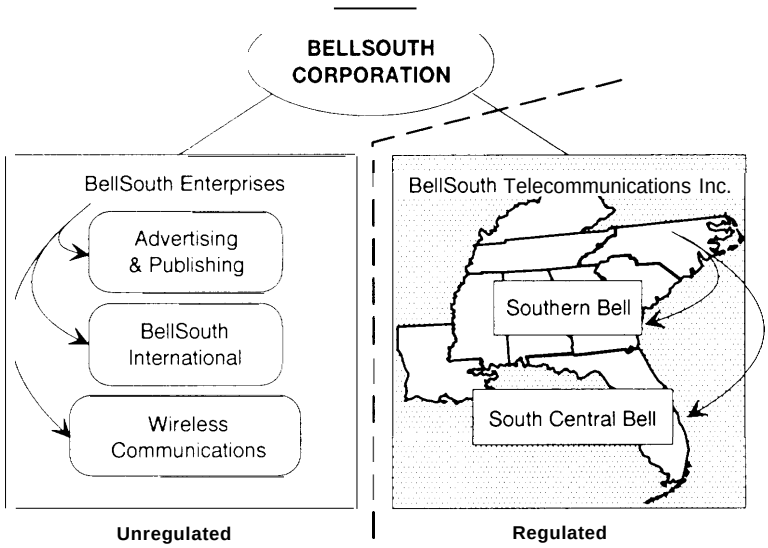
BELLSOUTH CORPORATION. **Bell South is** one of the most aggressive RBHCs in pursuing international ventures. It is heavily targeting Latin America, but it also is creating a substantial presence in Europe, mainly in cellular and paging operations. A subsidiary, BellSouth Enterprises, Inc., controls all nonregulated activities, including the company's international ventures, while BellSouth Telecommunications, Inc. deals with the regulated core businesses—the provision of basic telephone service within its nine-state region. BellSouth Enterprises is comprised of Bell South Cellular, BellSouth Publishing, and BellSouth International (BSI), which handles international operations and opportunities. BSI has a corporate office in Brussels for business development and technical expertise, but the strategy for its global activities is established in the Atlanta headquarters. The parent company expects that BellSouth Enterprises will quickly increase its percentage of revenues within the company to 25 percent.

The company's main emphasis in Europe is on cellular communications. It is prohibited in almost every country except the United Kingdom from offering alternative local service, which would draw on its great networking expertise. BellSouth owns 29 percent of a consortium to build and operate a mobile phone network in Denmark. In Germany, a consortium that includes BellSouth was awarded a license for the country's third cellular network; the cellular network will operate at 1800 MHz (as opposed to the more traditional 900 MHz) and will compete against cellular networks operated by Deutsche Telekom and Mannesmann (of which PacTel is a partner) .35 In

35 "German Mobile Phone Net work Won by Thyssen and Veba Consort ium,*Telcom Highlights International*, Feb. 10, 1993, pp. 2-3.

France, it has shares in several diverse enterprises, including a small stake in Societe Francaise du Radiotelephone, which holds a license for GSM, and a partnership with France Telecom to offer cable TV.

Elsewhere, BellSouth owns 24.5 percent of the Australian consortium, Optus Communications, in conjunction with Cable & wireless and local investors, which will build and operate a competing carrier for all kinds of wireline and wireless services and international long-distance (for which BellSouth had to secure a U.S. regulatory waiver). The company is providing cellular service in New Zealand, and was awarded the cellular license in Argentina, along with Motorola, in February 1989. BellSouth also purchased Cidcom, Pacific Telecom's cellular operation in Chile, and operates cellular systems in five Latin American countries: Mexico (western), Argentina, Chile, Venezuela, and Uruguay.



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993, BELLSOUTH ANNUAL REPORT.

Figure 4-4. Organization of the Be//South Corporation

NYNEX. New York-based NYNEX has vigorously pursued opportunities for foreign ventures. Its nonregulated activities, including its international ventures, are separated from its regulated local offerings (i.e., New York Telephone and New England Telephone). which are handled through its Telecommunications Group. NYNEX Worldwide Services Group is organized into branches covering cellular services in the United States, publishing (which involves some overseas activities), and its diversified operations, within which arc two subsidiaries that deal explicitly with international ventures.

NYNEX Network Systems Company, with regional headquarters in Brussels and Hong Kong and offices throughout Europe and Asia, is responsible for overseas communication networks and services, notably its 14 cable TV-telephony franchises in the United Kingdom. NYNEX CableComms was awarded franchises in July 1990 that make it the largest cable franchise owner in Britain, with an investment of $1.1 billion.[36] NYNEX Network Systems also owns 50 percent of Gibraltar Tel and is helping the government to modernize the communications infrastructure. The company is in Indonesia to help manage network expansion, and in Japan it owns a minority share of two mobile communications firms. NYNEX is also involved in a consortium to install two million lines in Bangkok, Thailand.

Various other subsidiaries of the company have successfully marketed products around the world. For example, its publishing arm, NYNEX Information Resources Company,

[36] NYNEX Cablecomms increased its presence in the U.K. cable TV/telephony market through its acquisition of three franchises from PacTel Cable in March 1993.

is responsible for telephone directories and Yellow Pages in Gibraltar and Prague and was recently awarded the franchise for the Czech Republic. NYNEX's AGS Computers, Inc. is licensing software in Russia, Mexico, Australia, and Spain. Finally, NYNEX is spearheading a consortium to construct a 25,000-km fiber-optic cable from the United Kingdom through the Middle East to Japan. The project, entitled FLAG (Fiberoptic Link Around the Globe), was initiated 2 years ago, will cost $1 billion, and is expected to be operational by 1997. The company is in the process of negotiating landing agreements with national carriers. NYNEX's previous attempt to purchase a stake in a private transatlantic cable was rejected on the grounds that RBOCs are restricted, under the MFJ, from carrying traffic to or from the United States.

In Central and Eastern Europe, cellular systems are attractive alternatives to antiquated wirelines.

U.S. WEST. Like the other RBHCs, U.S. West is capitalizing on its experience with cellular communications, but unlike the others it is targeting the countries of Eastern and Central Europe. U.S. West expects that 10 to 20 percent of its revenues will come from international operations by 2000; currently, international operations contribute only a small percentage. U.S. West is involved in a venture along with Bell Atlantic and the state telephone company to build and operate a cellular network in Czechoslovakia. A cellular network, Westel Radiotelefon, Kft., jointly owned by U.S. West and the Hungarian Telecommunications Co., went on-line in Budapest in October 1990. Though expensive, the cellular network, which is targeted at office communications, enables customers to circumvent the slow process for getting connected to the antiquated wireline network [37]

U.S. West International has established a strong presence in Russia for telecommunications services. In January 1993, the Russian Communications Ministry selected U.S. West and two domestic firms (Intertelcom and VART) to coordinate the development of digital cellular service (GSM) for Russia's 12 cellular regions; in addition, U.S. West and its partners won the rights to 8 of these 12 regions. [38] Previous ventures in Russia include operating a cellular telephone system in St. Petersburg (starting in September 1991), and outfitting the regular phone networks in Kiev, Moscow, and St. Petersburg with international long-distance switches.~[9] The company also was involved in a venture to build a fiber optic line across Asia, eventually linking Europe and Japan, but this plan was delayed by U.S. security restrictions on fiber optic technology and high-speed processors,

U.S. West, allied with Tele-Communications, Inc. (TCI) in the United States to pursue joint cable TV-telephone options, is also actively mining similar opportunities in Europe. In the United Kingdom, TeleWest Communications Group Ltd., the joint venture between U.S. West Cable Communications and TCI, is the country's largest cable TV operator with 16 franchises and a poten-

37 The service has surpassed projected use so far; 4,000 subscribers in the first 6 months saturated the network, which was expecting 2,500 subscribers in the first year.

38 "U.S. West Group Chosen by Ministry to Coordinate Russian GSM Digital Cellular System," Telecommunications *Reports*, Jan. 25, 1993, p. 18.

39 Andrew Kupfer, "Ma Bell and Seven Babies Go Global," *Fortune*, Nov. 14, 1991, p. 124.

tial customer base of 3 million households. As of March 1993, TeleWest had enlisted 144,000 subscribers for cable TV services, of which 60 percent additionally receive telephone service.[40] Through United Communications International, it is building cable TV companies in Sweden (Swedish Cable & Dish) and Norway (Norkabel), and it is developing systems and programming in Hungary with Time Warner. In the United Kingdom, U.S. West and Cable & Wireless merged their respective operations developing Personal communication networks in March 1992. U.S. West headed the Unite] partnership (which included Thorn EMI, Northern Telecom, and Deutsche Bundespost Telekom) that was awarded a license in 1989 to build a PCN system. U.S. west lnternational has joined with BMW and GTE to bid on a German PCN license.[41]

BELL ATLANTIC. Bell Atlantic is one of the most aggressive at targeting foreign markets, but its European ventures arc limited. Its chairman expects 10 percent of company revenuc to come from international operations by 1994; it is currently, at $1.5 billion, about 5 percent. Bell Atlantic, along with U.S. West and the state telephone company, owns and operates Eurotel, a cellular network in Czechoslovakia that began operation in September 1991. The venture will also build and operate cellular data networks and modernize the basic telephone network. Bell Atlantic in partnership with Ameritech acquired the Telecom Corporation of New Zealand for approximately $2.5 billion. The company also acquired a controlling stake in a New Zealand pay-TV operator, Sky Network Television. It intends to form a softwar, joint venture company with STET SPA, the Italian telecommunications group, to develop software systems that will be used by STET's telephone subsidiary Societa ltaliana per L'Esercizio delle Telecomunicazioni and Bell companies.[42]

PACIFIC TELESIS. Within the Pacific Telesis family.[43] two companies are Primarily involved in international ventures. PacTel Cable deals with opportunities in the "home entertainment industry' (the management of cable television operations) in the United Kingdom. while Pacific Telesis International offers a variety of services, such as wireless communications, value-added networks, and international l(~ng-distance service, in Europe and Asia. The company's flagship European venture is a 26 percent share of Mannesmann Mobilfunk, a consortium that built and operates a digital cellular network in Germany. Based on the European standard for digital cellular service, GSM, D2 Privat is the second national cellular franchise and will compete with Deutsche Bundespost Telekom. Pacific Telesis International also owns 23 percent of a consortium that is licensed to build a GSM-based digital cellular network in Portugal.

[40] Donna Pinsky, "U.K. Cable TV Ups Telecoms Ante," *Communications Week International*," Mar. 8, 1993, p. 6. Significantly, TeleWest is Investing S70.2 m Ill ion over 5 years to purchase its own switches to gain greater control of network services, rather than buy switching from Mercury Communications.

[41] "U.S. West Third Quarter Earnings," *Telcom Highlights International, Nov.* 4, 1992, p. 12.

[42] "Bell Atlantic in Italian Venture," *New Technology Week*, Dec. 16, 1991, p. 7.

[43] Pacific Telesis, pending regulatory and shareholder approval, is planning a major reorganization of its corporate operations to spl it off its unregulated business from its regulated operations.

PacTel Cable has recently lessened its involvement in cable TV services in the United Kingdom. In April 1992, PacTel Cable sold its interest in East London Telecommunications Ltd., which owned six franchises, to BCE Telecom International.[44] In March 1993, PacTel sold three of its original 14 cable TV franchises to NYNEX Cablecomms.[45] PacTel International sold its 25 percent stake in Microtel Communications Ltd., a venture with Matra, to develop a personal communications network in England.

In Asia, PacTel International is involved in consortia bidding for cellular franchises for Tokyo (through a 15 percent stake in Tokyo Digital Phone) and Osaka-Kansai (through a 13 percent stake in Kansai Digital Phone).[46] PacTel International also owns 10 percent of International Digital Communications (IDC), a new competitor to Kokusai Denshin Denwa offering long-distance and international services in Japan. IDC, which is the primary Japanese partner in an undersea fiber-optic cable connecting Japan and the United States, also will be the Japanese partner in the FLAG project, which NYNEX is spearheading to link Europe and Japan.

AMERITECH. Ameritech has been one of the most cautious of the Baby Bells in overseas investments, and its activities in Europe are small by comparison. Ameritech's most visible venture has been its acquisition, along with Bell Atlantic and two local firms, of Telecom Corporation of New Zealand. As part of the stipulation to reduce the combined U.S. RBHC holding to 49.9 percent, 31 percent of New Zealand Telecom's stock was offered for sale, resulting in an aftertax profit for each RBHC of $73.6 million.[47]

In Europe, the company joined with France Telecom to help the Polish PIT build and operate a national cellular network. The PIT retains 51 percent of the venture, Polska Telefonica Komorkowa, while Ameritech and France Telecom split the remaining 49 percent. In Norway, Ameritech (along with Singapore Telecom) purchased a quarter stake in Netcom GSM, the country's second provider of digital cellular services.[48] Ameritech subsidiary Tigon offers voice-mail service in a number of countries throughout the world.[49]

SOUTHWESTERN BELL. The jewel in Southwestern Bell's international crown is its acquisition of 20 percent of the Mexican telephone operator Telefonos de Mexico (TeIMex), including 24.5 percent of the voting rights. Through Southwestern Bell International Holding Company, the company teamed with France Telecom and Grupo Carso, a local industrial group, to purchase a controlling 51 percent of the company from the government. The initial

44 "BCE Unit Agrees to Buy PacTel, Jones Intercable Interests in U.K. Cable Franchises," *Telecommunications Reports,* Apr. 27, 1992, p. 34.

45 "Business Briefs," *Wall Street Journal,* Mar. 23, 1993, p. B4.

46 Pacific Telesis Group, 1991 Summary Annual Report.

47 Andrew Kupfer, "Ma Bell and Seven Babies Go Global," *Fortune, Nov.* 14, 1991, pp. 118-128; Ameritech, 1992 Annual Report.

48 Steven Tich, "Around the Loop: Norway Beckons," *Telephony,* Jan. 4, 1993, p. 10.

49 Ameritech's 1991 Annual Report, p. 20.

investment after exercising options totaled $950 million, though the value of the investment has increased significantly since then.

Like several other RBHCs, Southwestern Bell also has stakes in cable TV/telephony operations in the United Kingdom. The company controls eight franchises in Britain covering over a million households; it recently announced a plan to sell 25 percent of its U.K. cable holdings to Cox Cable, the second-largest U.S. cable operator.[50] Before the Israeli Government decided to postpone the sale of Bezeq, the Israeli telephone company, Southwestern Bell was rumored to be negotiating to bid for the company in alliance with a large Israeli industrial group, Clal Industries.sl

The overseas strategies of RBHCs

U.S. RBHCs, along with Western European PTOs and U.S. interexchange carriers, arc among the corporate leaders in pursuing investment options in foreign markets. It is difficult to track precisely the number and value of foreign investments that RBHCs have made since divestiture since many of these arc small, unrelated to telecmnmunications, and often not newsworthy. The scale of these ventures and the fervor surrounding them increased with the privatization of telephone operators and the opening of new markets in Central and Eastern Europe. Earlier international investments by telephone operators were typically more '*opportunistic" than "strategic"; companies would seek deals primarily on the basis of an attractive rate of return, with little attention to whether the ventures reflected the companies' characteristic strengths or coincided with any long-term strategies.[52] More recently, the telephone companies are taking advantage of the niche strengths that separate them from other carriers and give them a competitive edge. These opportunities abroad permit U.S. telecommunications firms to extend the strengths from their domestic businesses in network, wireless, and business systems, profiting from their U.S. expertise in managing and operating local telecommunications[53] while forging strategic relations with other firms.

For an RBHC, the most important criterion for foreign ventures is the prospect of high returns.

For an RBHC, the most important criterion for foreign ventures and investments is the ability to earn high returns. A second important criterion is the experience and political leverage that the RBHC can bring back to the United States. Overseas, RBHCs can experiment with services and businesses that they are barred from in the United States as monopoly carriers.

50 "U.S. Cable-TV and Telephone Company Get Together for UK Cable," *Telcom Highlights International*, Mar. 10, 1993, p. 5.

5.Tich, op. cit., footnote 48.

52 Ronald M. Serrano, P. William Bane, and W. Brooke Tunstall, "Reshaping the Global Telecom Industry," *Telephony,* Oct. 7, 1991, pp. 38-42.

53 More than 93 percent of U.S. households have telephone service (Federal Communications Commission, *Statistics of Communications Common Carriers*, 1991/1 992 Edition). Many of the remaining 6.6 percent of households are thought to be without service by choice rather than necessity. The mandate for "universal service" has effect ively been achieved. Sweden boasts a higher number of telephones main I ines per capita than the United States, however; Sweden has approximately two telephone main lines for every three people compared with about one for two in the United States.

Encouraging foreign expansion

Should the U.S. Congress want to do more to support and encourage further exports of telecommunications services and additional foreign investment by U.S. telecommunications companies, it has several options:

- continue to promote the opening of foreign markets to U.S. entry;
- remove domestic restrictions or regulations that allegedly affect the pattern of investment by foreign telecommunications companies (this action is urged by some, however, as a way to de-emphasize foreign investment); and
- provide positive assistance, e.g., low-cost capital for overseas expansion.

United States' efforts to open European markets through trade negotiations are discussed in chapter 7. The complex pros and cons of the current investment patterns, and the effect of domestic regulations, are discussed in chapter 9; it does not appear that domestic restrictions are now determining factors in decisions to expand overseas.

Some telecommunications industry representatives have suggested that the U.S. Government should provide more support to U.S. firms for telecommunications services exports, in the form of financial assistance and insurance.[54] The issue of whether U.S. firms are unduly handicapped in international ventures for lack of access to low-cost capital, which often foreign competitors often enjoy, usually arises regarding equipment exports rather than service exports. Yet, U.S. Government financing assistance is in fact biased toward manufactured goods because, compared with services, these appear more tangible and readily quantifiable. For example, the benefits of supporting the sale of several million-dollar switches abroad are politically more readily apparent than assisting a U.S. firm to purchase a portion of a foreign telephone operator, the value of which may not materialize for several years.

Some foreign governments actively support national champion manufacturers in securing foreign deals by low-interest loans or other means.[55] They may also permit an indirect subsidy in the form of over-priced procurement of equipment by the national network operator (paid for by high customer services charges), allowing the equipment provider to sell in foreign markets at artificially low prices. U.S. export subsidies are limited, and are intended to ' 'level the playing field" when U.S. firms are clearly

[54] These suggestions were made in response to questions f rom the Office of Technology Assessment as to whet her government act ion was needed to enhance t he com pet it iveness of U.S. telecommunicate ionrms overseas.

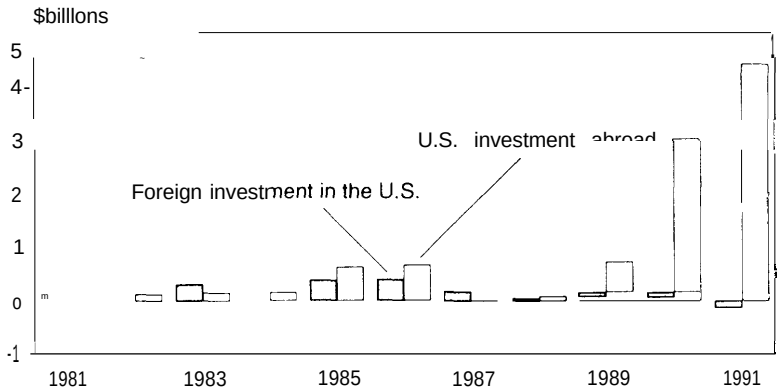
55 Advisory Comm ittee on International Communicant ions and Informat ion Policy, U.S. Department of State, "Study of International Financing of Telecommunications," Washington, DC, June 1992. This report is oriented toward the financing of export of telecommunications equipment sales rather t han services. Where it analyzes services investment, it mentions as a major benefit from such investment the potential boost to U.S. equipment trade. However, the only U.S. operating companies that are also equipment makers are AT&T and GTE. The other carriers often cultivate relations with several key suppliers, including foreign manufacturers such as Siemens, Alcatel, and Northern Telecom. MCI, whose network relies on equipment from 75 vendors, touts its vendor-neutrality. ("MCI Pulling Together Global Alliances," *CommunicationsWeek International*, Sept. 21,1992, p. 7.) Further, foreign governments can impose procurement criteria (e.g., t he Utilities Directive).

losing out to foreign firms that rely on more aggressive or explicit subsidies.[sfi]

U.S. Government mechanisms that could potentially assist foreign telecommunications services ventures include the Agency for International Development (AID), the Export-Import Bank, the Overseas Private Investment Corporation (OPIC), and the Trade and Development Program.[57] However, these program-when they include services providers—generally target developing countries rather than Europe (some Central and Eastern European countries may be covered). Such foreign services investments typically require financing insurance, since they generally target developing countries, which are potentially susceptible to political instability}. Few commercial banks arc willing to fund these ventures.

There is, however, little reason to believe that U.S. telecommunicitions companies arc constrained in overseas ventures by lack of financing. Most such ventures arc financed out of retained earnings.

Stockholders reportedly arc uneasy that the RBHCs capital is financing overseas ventures, the payoff for which is long term and, by comparison to their reliable monopoly service, uncertain. There is a growing tension between the expectations that stockholders have come **to** hold and the RBHCs' plans for overseas expansion. The Bell stocks have earned a solid reputation for steadily increasing value and for rising dividend payments. (RBHCs have had 56 opportunities to increase dividends in the 8 years since their inception in 1984, and they have in fact increased dividends 54 times.[58]) The pressure to maintain this traditional performance for stockholders is increasingly at odds with the cornpanies desire to diversify into overseas ventures.[59] (See box 4-B.)



SOURCE SURVEY OF CURRENT BUSINESS, BUREAU OF ECONOMIC ANALYSIS, 1993

Figure 4-5. Direct Foreign *Investments in Communications,* 1981-91

Conclusions

The increasing attention of RBHCe to European markets is largely a result of new opportunities there, compared with more nearly saturated and competitive markets here. RBHCs have had most of the tools to exploit foreign markets since their inception in the divestiture of AT&T: large cash reserves, unsurpassed management and network operating experience, and slow-growing domestic markets and the incentive

[56] Advisory Comm ittee on International Communicant ions and Information Policy, U.S. Department of State, "Study of International Financing of Telecommunications," Washington, DC, June 1992.

57 The FCC also supports foreign activities of U.S. firms, but as an independent regulatory agency it has no direct Influence over the Federal Government's lending agents, such as Exlm Bank, OPIC, or AID.

58 Peter Coy, "Are High Dividends Stunting the Babies' Growth?" Business Week, Oct. 5, 1992, p. 134.

59 A recent *Business Week* article reported, for example, that stockholders were "unhappy" that t he RBHCs' "foreign ventures are consuming cash rather than generating it." "The Baby Bells' Painful Adolescence," *Business Week,* Oct. 5, 1992, p. 124.

Box 4-B. Foreign Carriers Operations in the United States

The robustness of the U.S. telecommunications environment makes it attractive to foreign firms. Most major foreign telecommunications operators aspiring to an international market have opened offices in the United States, and several are pursuing more ambitious plans. BT, in particular, is establishing a strong presence. in June 1993, BT announced its intention to purchase 20 percent of MCI for $4.3 billion and to form a joint venture company with the U.S. carrier. This major deal follows several other attempts by BT to gain access to the U.S. market, including its acquisition of the data network firm Tymnet from McDonnell Douglas in 1989 and its location of Syncordia, its consortium offering global network services, in Atlanta. ' BT's alliance with MCI comes shortly after the company sold its 20-percent stake in McCaw to AT&T, the leading U.S. cellular firm. Telefonica, t he Spanish telephone operator, is attempting to purchase 80 percent of the long-distance carrier in Puerto Rico, and France Telecom has indicated its interest in acquiring Westinghouse Communications, which offers a variety of switched, virtual, and private-line voice and data services to more than 100 companies, including its parent company, Westinghouse Electric.[2] Cable & Wireless operates a small interexchange carrier in the United States with approximately 1 percent share of the total international market.

1 The joint venture company formed by MCI and BT will subsume Syncordia, and MCI will take control of BT's North American holdings, including Tymnet.

2 Barton Crockett, "French, German Carriers to Buy Into BT's Syncordia," *Network World*, Feb. 17, 1992, p. 2.

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

to explore overseas. The critical clement that has attracted them to Europe is the liberalization in telecommunications administrations in the last 3 or 4 years and the promise of further access,

Users' Perspectives– Views of U.S. Services Exporters

CHAPTER 5

Service-exporting *firms agree they are generally we// served by U.S. carriers.*

U.S. TELECOMMUNICATIONS FIRMS not only compete successfully in the European market, they support and often provide the competitive edge for other U.S. firms that deliver services to Europe. This chapter captures some of the perspectives of these users of U.S. and European telecommunications networks.[1] Providers of travel and transportation services, financial services, and architectural, engineering, and construction services are given particular attention either because the y contribute strongly to the volume of U.S. services exports, or because they represent sectors where considerable growth in services exports is possible with more intensive use of telecommunications. Exporters of these and other kinds of services provided information for this chapter through interviews, letters, and responses to a written questionnaire.

Many of the corporate officials that responded to inquiries of the Office of Technology Assessment (OTA) argued that the U.S. Government has a role to play in encouraging both the liberalization of European markets and the efforts of U.S. industries to expand the export of services. The themes most commonly expressed were that government should:

- Apply strong and persistent pressure, through trade negotiations and other diplomatic contacts, for further opening of European markets and removal of trade barriers for both services and manufactured goods;
- Pay special attention to reducing restrictions on telecommunications services, since for most of these companies the use of American equipment and American-provided enhanced information services is highly desirable; and
- Encourage both U.S. and European firms to move toward international standards as the most cost-effective way of getting the most out of information technology resources.

In all services-exporting industries surveyed, most firms agreed that they are well served by U.S. telecommunications carriers, **and** that American communications and computer technology gives them a competitive edge in developing innovative services.[2] Accustomed to a geographically expansive domestic market, the firms complain bitterly about the wide difference across European countries in availability of telecommunications services and the difficulties of dealing with many regulatory regimes within what seems to them one natural market. From their perspective, the benefits of an integrated European marketplace seemingly are more

[1] In preparing this chapter, the Office of Technology Assessment (OTA), with the help of contractors, conducted three case studies of the use of international telecommunications by major sectors exporting services to Europe (travel and transport; banking; and architectural, engineering, and construction). Representatives of more than 40 firms and trade associations were interviewed for these case studies. Another dozen firms contributed information in response to mailed inquiries from OTA staff and the chairman of the project's advisory panel.

[2] For example, an energy firm said: ". . .U. S. competence in telecommunications and computer technology provides advantageous information and decision support processing capabilities that are reflected in Improved accuracy, timeliness, analysis, and integration of products that support our objectives for customer service. " (Thomas M. Woods, Vice President for Information Services, the Hall iburton Company, correspondence with OTA, July 30, 1992.)

obvious than the risk that a "Fortress Europe will try to exclude them. Many firms said that if serious regulatory problems can be alleviated there arc good prospects for expanding and diversifying their services exports.

Many of the problems encountered by American services industries in dealing with European public telephone operators (PTOs) are problems just as much for European firms as they arc for U.S. competitors. If U.S. telecommunications firms can gain wider access to the European market, their biggest marketing opportunity will be the challenge to solve these problems not just for American firms but for potential European customers.

Some U.S. firms operating in Europe had a more positive view of their experience than others had. A news firm said, ''On the whole, our experience with European telecommunications operators has been positive. The variety, quality and availability of communications services is, with few exceptions, excellent. (At the same time, the firm noted that services sometimes cost ''5 to 10 times their equivalent in the United States."[3]) A large financial institution said: ". . .we have had little or no difficulty with the financial services regulatory policy bodies or with the telecommunications regulatory authorities in developed countries that already have state-of-the-art information networks infrastructure. These strongly positive comments were not typical. However, many of the business people that contributed to this chapter, anticipating that the move toward deregulation or liberalization in Europe will continue, said conditions in Europe are likely to improve steadily.

The general outline of the community of U.S. services exporters is shown in figure 5-1. Over half of all U.S. services exports are transportation-related services (which include airline fares, shipping and port fees, and all tourist-related services provided in this country and other countries to foreigners).[5] Licenses and royalties (intellectual property earnings such as income from movies and music) are the second largest group, but account for only 12 percent of total services exports. All other services combined account for less than one-third.

Problems with European telecommunications networks

Many serious or frustrating technical problems beset U.S. services providers using telecommunications in Europe. Some of these problems are regulatory or institutional, but many simply result from the necessity for U.S. firms to rely on European technology and services at the far end of their international networks and for their intra-European communications. In some countries the infrastructure is technologically behind that in the United States, in other cases it is not interoperable with U.S. networks, and in all cases it is unfamiliar. U.S. firms must often depend on the very organizations with which they arc competing for

[3] Letter from Martin Fuhr, Director of Telecommunications, *The International Herald* Tribune, to John Diebold, OTA Advisory Panel Chairman, Sept. 25, 1992.

[4] Letter f rom Richard M. Rosenberg, Chief Executive Officer, Bank of America National Trust and Savings Association, to John Diebold, OTA Advisory Panel Chairman, July 9, 1992.

[5] Note that a service delivered in this country to a foreign national, such as medical treatment or education, is counted as an exported service.

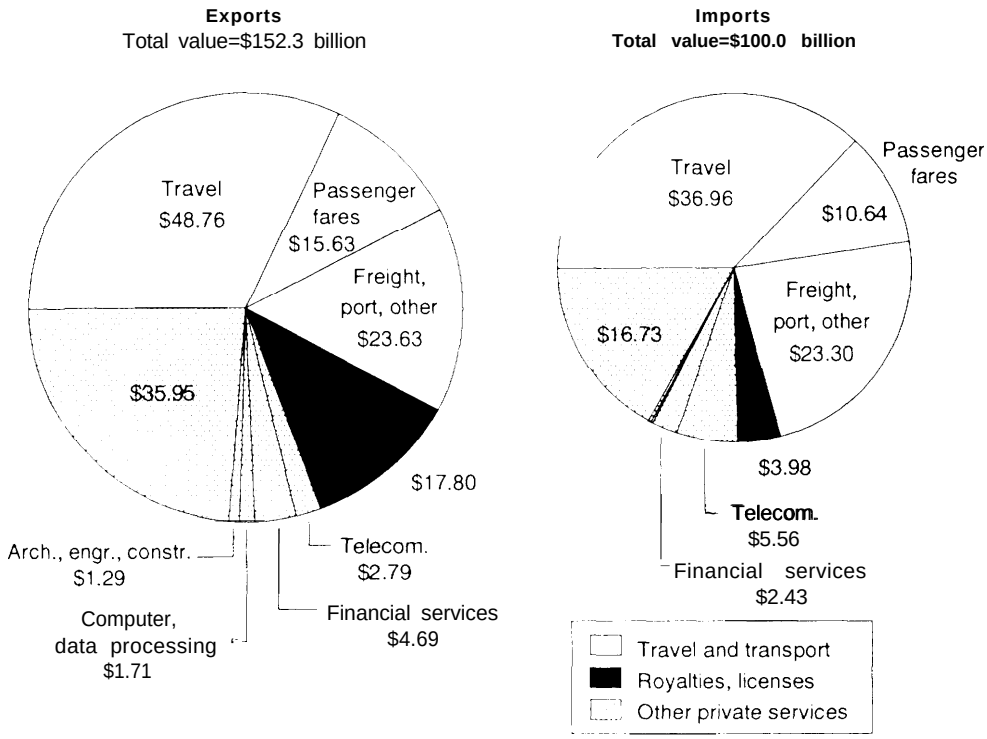


Figure 5-1.
U.S. Services Trade by Sector, 1991
($billions)

SOURCE U S DEPARTMENT OF COMMERCE, BUREAU OF ECONOMIC ANAL YSIS, 1993

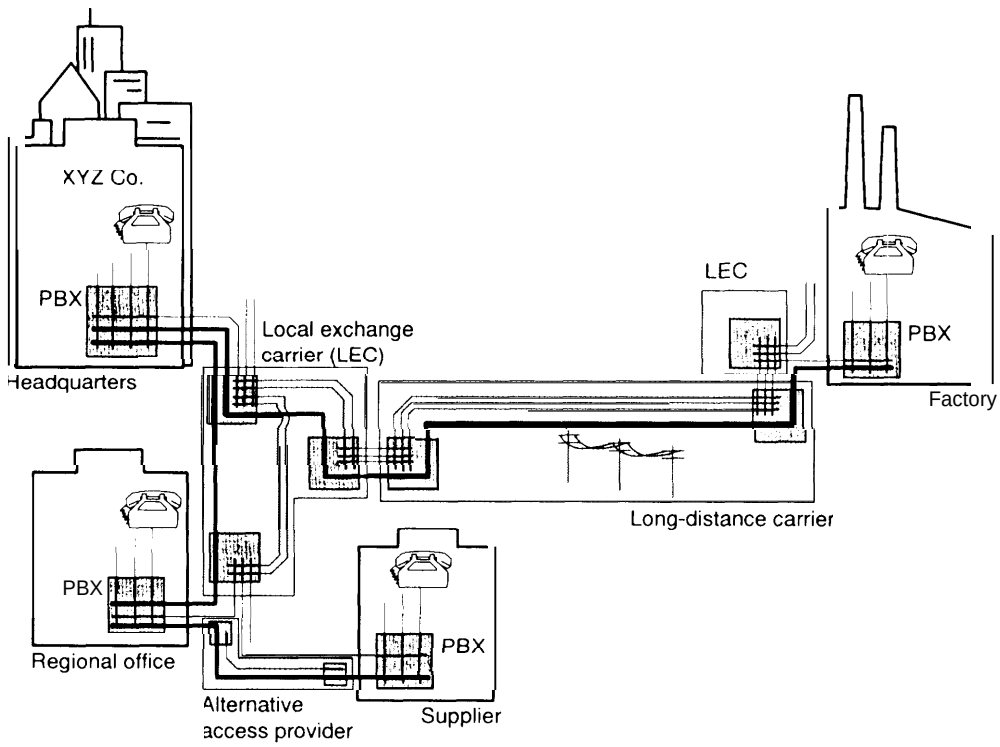
the final delivery of their services, or they must deal with government bureaucracies that have only recently and reluctantly opened their markets to foreigncrs.

The nonavailability of leased lines in some countries and the long delays in installing them in others arc common complaints of U.S. users.[6] Financial institutions, for example, put high priority on the freedom to usc private line services as they choose, and emphasize the need for leased line prices based on costs. They want permission to interconnect private networks with public networks and to connect preferred terminal and network equipment. Several firms complained about the lack of reliability of leased lines. In confirmation, a recent survey conducted by the International Telecommunications Users Group (INTUG) reported that only one-third of all leased circuits was available 100 percent of the 3-month period examined, and 64 kbps circuits had an availability rate of 99.0 percent, Availability of 99 percent means that downtime averaged

[6] This situation should gradually Improve as the result of t he EC Directive on Open Net work Provision, which calls for every member state to make avai l able five categories of leased lines, with no restrictions on their use. (See ch. 3.) Although the Directive called for full Implementation by June 1993, European observers say it may take much longer before this directive is fully Implemented. International Telecommunications Users Group, *INTUG News,* London, October 1992.

Figure 5-2. Leased-Line Private Network

A (dedecated) leased-line private network is preferable for a user requlring the interconnection of several locations with high traffic volumes. The transmission capacity that the user leases from the public earner(s) goes through the earner's(s') facilities, but revolves no switching since the routes are dedicated solely to that user. Note that the user can connect to a long-dstance carrier directly or through either the local exchange company (e. g., a Bell Operating Company) or through an alternate access provider, such as Teleport or Metropolitan Fiber Systems.



SOURCE. OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

1 hour, 40 minutes per week, and is well below recommendations by the Consultive Committee for International Telephone and Telegraph (CCIIT) of a minimum 99.6 percent availability.[7] This is especially disruptive for users of higher bandwidth digital links because such lines handle more traffic than analog circuits.

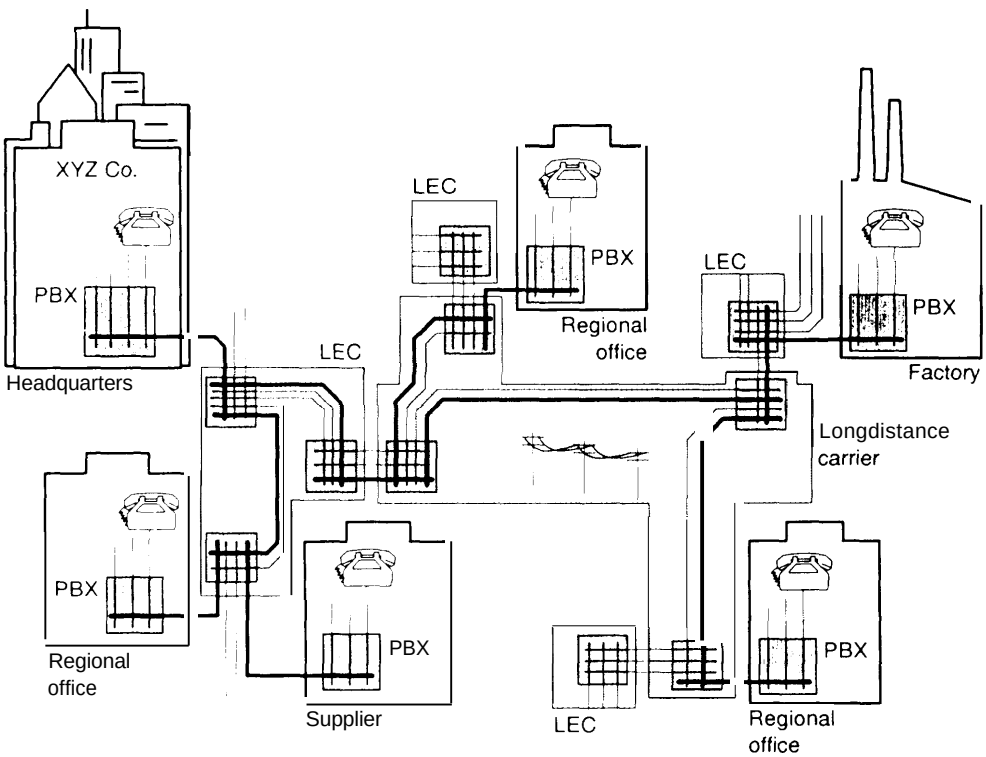
The lack of fast data transmission is a serious problem both for U.S. firms and for their European competitors. A European bank told OTA that in some countries it could not get data transmission as fast as 2 Mbps, or there are problems with getting and maintaining transmission.[8] Said the bank official:

> *This situation has to be compared with the options available to U.S. firms in their domestic market, [where], . . even 45 Mb/s channels can be obtained at prices designed to encourage the experimentation and learning needed to inte - grate new applications with a firm's operations.* [9]

[7] Ibid.

[8] In Spain, a travel services company reported that speed on leased lines in some areas does not exceed .3 kbps or 300 baud.

[9] Comments provided by Ulrich Cartellieri of the Deutsche Bank AG to John Diebold, Chairman of the OTA project's advisory panel, for OTA use, Aug. 19, 1992.



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

Figure 5-3. Virtual Private Network

To the user, a virtual private network (VPN) appears to be identical to a leased-line network in terms of functionality-presubscribed bandwidth, abbreviated dialing, etc. However, while the "intellitgence" in a dedicated network resides m the customer's PBX, a VPN relies on the software in the public carrier's(s') switches for routing calls, rather than sending them through preallocated "pipes." As a result, a VPN is more flexible and, therefore, well suited to inferconnect many sites with moderate traffic (enough that direct dial costs become high but not enough to justify a dedicated line). Like a dedicated leased-line network, a VPN can be configured internationally (this illustration does not include an international component).

Enhanced services such as virtual private networks, packet-switching, and interactive very small aperture terminals (VSAT) are not available in some areas at any price. Where they are available from public telephone operators, they are often not interoperable across national boundaries. They may be at different stages of development or there may be differing national standards. As U.S. services producers increasingly move to the use of frame relay technology, they are finding that features and functions available in the United States are not the same as those available in Europe.

Crossborder payments are a special problem for financial services firms. National clearing systems differ in degree of automation, formats, access, and reporting systems.[10] Integrated fault resolution is either not available or requires users to put their own support personnel at both ends of a circuit.[11] Concerns about data security are not addressed by most European carriers and

[10] See U.S. Congress, Office of Technology Assessment, *Trading Around the Clock: Global Securities Markets and Information Technology*, OTA-BP-CIT-66 (Washington, DC: U.S. Government Printing Office, July 1990).

[11] Letter from John M. White, President of the Information Technology Group of Texas Instruments, to John Diebold, Chairman of the OTA project's advisory panel, July 2, 1992.

companies must provide their own engineering and technical support for this purpose.

A nearly univeresal complaint is the high cost of telecommunications. Voice calls from Europe to U.S. headquarters can be 50 to 100 percent higher than calls in the other direction. lntracountry costs are also high. '2 Leased line costs, although they have recently declined somewhat, arc still high. This constrains private network optimization and business operations. Nevertheless, and in spite of complaints. these costs are to a large extent accepted as the price of doing business in Europe. They do not generally discriminate against U.S. firms.[13] (See figure 5-4.)

European PTO high tariffs, billing practices, installation delays, **and other** *problems constrain business use of telecommunications.*

The problems resulting from technological incompatibilities are compounded by institutional inconsistencies and vagaries. U.S. firms complain of excessive variability in European ordering and payment procedures and contracting arrangements, and of uninformative. confusing, and irregularly timed billing. In some countries bills are reported to arrive up to 2 years late, and in other countries firms may be requested to pay for a year's service in advance. At best, planning and pricing new communications-based services are difficult because of the wide variety of billing cycles and formats and currency conversion problems.[14]

Another major complaint is the long time required for PTOs to install circuits. One U.S. travel-related company reports that promised installation dates are not met 85 percent of the time, and very commonly it takes double the estimated time.

American firms are typically impatient with the need to negotiate separately with many countries to install one network. A General European Network (GEN) becomes operational in the spring of 1993, with 16 Mb/s capacity, operating between Frankfurt, London, Madrid, Paris, and Rome. This is to bean infrastructure, not a service, and should shorten time for getting private circuits operating across several countries. GEN was designed by European Telephone Operators to preempt pan-European networks that might be offered by American firms.[16] It is a joint venture by France Telecom, BT, Deutsche Telekom, Telefonica (Spain), and ASST/ STET (Italy).

GEN will not end the coordination problem. A spokesman for INTUG says:

> *Differcnces in rules and regulutions among the various telecom operators make the management of business tele -*

12 American Airlines, for example, says that an average 70 percent of reservation communications costs are in the local loop between the long-distance carrier and the SABRE terminal.

[13] It was reported to OTA, however, that in a few countries high costs and bureaucratic intransigence are compounded by the demand for bribes.

[14] In Germany, a group has been formed to protest the refusal of Deutsche Bundespost Telekom to itemize charges rather than issue blanket statements, as well as to protest its high tariffs. "Providers Band Together," *Communications Week International*, May 1991, p. 3. The group, the Association of Private Telecommunications Providers, includes subsidiaries of AT&T and General Electric (GEISCO).

[15] This company said that it t ypically had a 30 days' wait in the United Kingdom, and a 150 days' wait in Italy and Greece.

[16] Reportedly the fear is that AT&T would be the first to build a pan-European network as regulations are liberalized. "Euro-Broadband Net Set,"*Communications Week International*, July 20, 1992, p. 3.

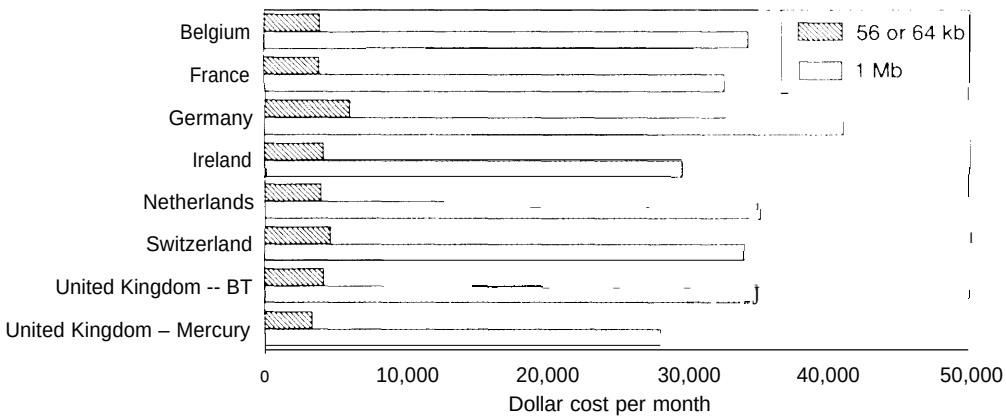


Figure 5-4. MoM/y *Charge for Half of Private Line to the United States From Europe, 1992*

SOURCE *NETWORKWORLD*, VOL 9, NO 10, MARCH 9, 1992, P 32

communications in Europe a frustrating and wearisome experience. This requires network planners to acquire a vast knowledge about bureaucracy, rules, procedures, and tariffs.[17]

To a large extent, these problems merely reflect the fact that the ''European market'' is still made up of many national markets, and the problems will be resolved as the move toward a single market goes forward. They are, in the meantime, problems as much for European firms as they are for U.S. competitors. If liberalization of markets continues and U.S. telecommunications firms gain wider access to the European market, the challenge to offer an alternative to these problems will be their biggest marketing opportunity.

European regulatory problems

Regulatory restrictions are said by some U.S. users to be more troublesome than technical problems. Among the worst of these appear to be restrictions on connecting leased lines to the public-switched networks and on the use of non-PTO equipment. The latter force users to adopt unfamiliar and incompatible equipment, and in many cases to maintain redundant systems in order to deliver services.[18] For example, a U.S. network services provider competing in the United Kingdom was not allowed to use

[17] Ernst Weiss, Vice Chairman of INTUG, Europe, quoted in "Europe's Telecoms Users Speak Out, " *Communications* Week *International*, June 22, 1992, p. 29.

[18] Europeans point out that procurement restrictions are not one-sided. American computer companies (e.g., IBM, Digital, NCR) are usually in the top five suppliers in national markets across Europe including in some countries the government procurement sector. By contrast, according to some Europeans, non-U. S, suppliers to the U.S. Government are rare, as a result of Buy America laws. The E.C.Directive aimed at opening public procurement in telecommunications/com puter equipment to com petition allows preference for European suppliers only if the price differential is not more than 3 percent. On Feb. 1, 1993, the Off Ice of the U.S. Trade Representative prohibited government procurement of many EC products not specifically covered by trade agreements and threatened other actions in response to EC "discriminatory procurement practices. "

AT&T equipment and complains that it had to struggle to adapt BT hardware to its network. '9 When approval to use imported technology is granted, the approval process may take many months or even several years.

There is little that U.S. telecommunications companies can do to solve these institutional problems, which make it difficult to offer the ''one-stop shopping' and ''seamless global networks' that U.S. multinational corporations say they need. For users, these problems add up to greatly increased costs of doing business. Added to tariffs that are very high by U.S. benchmarks, are high equipment costs, maintenance costs, and value-added taxes that U.S. services firms say prevent them from offering services at the lower prices they could otherwise aim for.

Another regulatory issue of particular concern to providers of financial services and data processing services is national legislation aimed at privacy protection. An EC privacy directive that was proposed in 1990 could have disrupted the use of transnational financial data systems by restricting the flow of data across national boundaries or by requiring explicit consent for each use (or processing) of certain personal data. The proposed Directive was strongly criticized by the European Parliament. A new version that reportedly will be much less restrictive was to be issued in October 1992, but has not yet appeared. There is a separate proposed Directive on protection of personal data in the context of public digital telecommunications networks. According to the U.S. International Trade Administration, '' l-J. S. industry believes that the proposed umbrella data protection Directive and the Council of Europe Convention will provide adequate protection. . . . [and] a sector-specific digital services Directive is therefore unnecessary and could create uncertainty and disruption in the provision of telecommunications services. ' '[20]

Various national laws also restrict the flow of data. This is seen as an attempt to keep data processing jobs within the country, by many U.S. firms that want to consolidate their own data processing in a few large centers for greater efficiency. This concentration would have another benefit for the United States, in that large computer systems are most often supplied by U.S. manufacturers such as DEC and IBM.

Representative services export sectors

Travel and transportation services[21]

Travel and transportation accounted for 58 percent of exported services in 1991, but contributed only one-third of the services

[19] Letter f rom Joseph 1. Dione, Chief Execut ive Off ice of McGraw-Hill, Inc., to John Diebold, Chair of the OTA project's advisory panel, July 27, 1992.

20 U.S. Department of Commerce, International Trade Administration, "E.C. Telecommunicate ions," release of Oct. 1, 1991.

2. This section draws on an OTA contractor report: Gligor Tashkovich, "The Use of International Telecommunications Net works in t he Delivery of Transportation and Travel-Related Services," September 1992. Interviews were conducted in, and corporate profiles were constructed for, two major airlines, three network support or computer processing firms serving airlines, two hotel chains, two package delivery f irms, and a diversified travel services firms. Other travel-related firms contributed Information directly to OTA through participation in mail surveys or workshops.

trade surplus.[22] About 10 percent of the total trade surplus came from airline passenger fares.

Airlines depend heavily on satellite communications for navigation, position reporting, weather information, and traffic control (and more recently, for passenger telephone calling). It is, however, their electronic reservation systems that arc considered major factors in intraindustry competition.[23]

Airlines use private leased lines, public switched networks, shared networks and third-party networks, usually with satellitc back up, to connect reservation centers, airports, and travel agencies. They are constantly seeking ways to get higher bandwidth and decreased costs. For example, American Airlines' SABRE travel information and reservations computer system operates in 10.000 locations and has 225.000 terminals, of which 4.500 arc outsidc North America.[24] Of the overseas locations, about 500 arc on a private network and 4,000 arc interconnected through SITA (Societe Internationale de Telecommunications Aeronautiques).

SITA is a network serving the international airline industry. It operates in 187 countries. has 24 hub sites interconnected by three separate communications paths using both cable and satellites, and is one of the worlds heaviest users of international leased circuits. A French company, SITA appears to be recognized not as a competitor but as the critical backbone that holds the entire airline industry together.[25] Other third-party service providers also provide data processing or network support for airlines or handle their reservations and ticketing; most of these are U.S. companies. and some are jointly owned by several airlines.[26]

Freight transport also relies heavily on telecommunications. One of the difficulties here is coordinating and tracking goods movements that may require several travel

Electonic reservation systems *are* *considered a major factor in airline competition.*

[22] In 1991, the large trade surplus in passenger fares ($5 billion), travel services ($1 1.8 billion), and port services ($4.9 billion) was reduced by a deficit in freight transport (-$4.7 billion) .

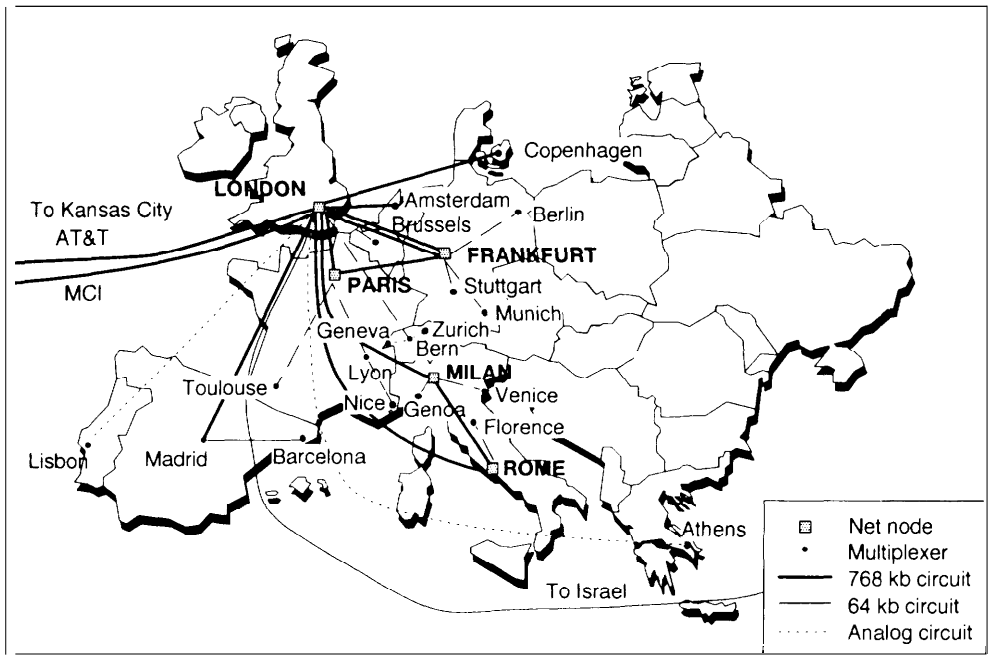
[23] European computer reservation systems, American firms said, are biased; the flights of the sponsoring airlines are booked first. This charge was made against U.S. computerized reservation systems in their early days.

24 During recent "fare wars" in the United States, American Airlines set a record by processing over 3,100 messages in 1 second on its SABRE system, and United Airlines doubled the usual number of reservations transactions on its system to 2,100 per second. It was also reported that AT&T itself set a daily record of 177.4 m Ill ion calls on t hat same day, as compared with an average volume of 135 to 140 m ill ion calls. "Airfare War Strains Data, Voice Nets," *CommunicationsWeek*, June 8, 1992, pp. 1.

25 Tashkovich, op. cit., footnote 21. See also "Freedom of Choice," *Communications Week International*, Apr. 6, 1992, p. 1. In April 1992, SITA's subsidiary International Telecommunications Services BV was renamed Scitor, Ltd., and relocated in Maiden head, England. It will provide value-added network services, including E-mail and electronic data interchange, for 250 customers such as Budget Rent-A-Car Corp. and Hilton International Co., linking t hem into t he SABRE system. SITA is said to have taken t his step "because it sees little room for growth in the airl ine communications sector. ""SITA Broadens Base," *Communications Week International*, Apr. 6, 1992.

[26] For example, PARS Service Partnership provides data processing or network services or both to Trans World Airlines, Northwest Airlines, and some regional carriers. WORLDSPAN, which provides airline schedules and information services to t ravel agents worldwide, is owned by affiliates of Trans World Airl ines, Delta Airlines, Northwest Airlines, and ABACUS Distribution Systems (a computerized reservations systems which in turn is owned by nine airlines in the Far East).

Figure 5-5. The Programmed Airline Reservation System Network



SOURCE PROGRAMMED AIRLINE RESERVATION SYSTEM, JUNE 1992.

modes (sea or air, rail, truck) and may cross several national boundaries and time zones. A triumvirate of U.S. companies has formed Encompass Europe, NV, to offer a data-network tracking service for multinational corporations that send inventory worldwide. This will allow shippers, consignees, forwarders, and carriers to communicate through a single electronic interface regardless of the kinds of computer systems they use.

U.S. package delivery systems operating in Europe are in direct competition with national postal systems, serving primarily business customers looking for speedier services than postal authorities offer.[27] The challenge is to operate ground-based delivery systems that must be fed through an international air network and must delivcr within a tight time frame. Package delivery firms said that telecommunications is the single most critical factor in success in the European market, and U.S. technological know-how gives them a competitive edge,

United Parcel Service (UPS), for example, has four communications systems using both public and private international networks and local packet-switched data networks. These systems are used for package routing and vehiclc/aircraft control; international

27 The Federal Express Corporation in 1992 drastically reduced its operations in Europe, shutting down operations in over 100 cities; it will continue to serve 16 major business centers directly for intercontinental shipments. The company was reported to have lost $1.2 billionin 4 years. "FedEx: Europe Nearly Killed t he Messenger," *Business Week,* May 25, 1992, p. 124.

billing and receivables transmission; electronic messaging for company coordination; and electronic data interchange (ED I) for package tracing, links to financial institutions, and links to other services such as weather reporting. UPS recently got Federal Communications Commission approval to provide common carrier services by acquiring capacity in three transoceanic cables (two of which cross the Atlantic) .28

Hotels, like airlines, depend on international telecommunications to handle reservations, as well as for intrafirm coordination and handling and charging for calls made by guests. U.S. hotels in Europe say that they need, but do not yet have, integrated reservation networks operating across countries and linked to airline reservation systems. They also report that they need better software that can be continually updated for changing area Codes.

The Sheraton reservation network, for example, consists of interconnected star networks with hubs in major European cities, each hub connected by 56 kbps leased lines to hotels and reservation centers. However, the network in fact covers only 10 percent of the hotel chain's properties, because the number of facilities changes rapidly but also because in some countries the telecommunications options are ''very limited. '

Holiday Inn Worldwide has about 150 locations and 14 reservation offices in Europe. The company uses the TAT-8 and TAT-9 transatlantic cables for a 64 kbps link from Brussels to London to New York (its headquarters is in Atlanta). It had been using a conventional terrestrial star network within Europe, with the hub in Brussels, but in 1992 the company began a transition to a VSAT network operated by MCI, using INTELSAT. which will have 120 to 150 Earth stations in the United Kingdom. Belgium, France, Germany. Italy, and the Netherlands.[29] This will connect all of the chain's proper-tics in these countries, but MCI cannot offer a pan-Europe network under existing regulations. It will provide terrestrial links until it obtains licenses needed to operate VSATS in the six countries. Holiday Inn Worldwide says that the reason for the move is to 'circumvent the problem of long (and often unpredictable) service delivery times required for leased lines."[30]

Financial services[31]

About 3 to 5 percent of U.S. services exports are financial services, primarily in commercial and investment banking. In 1991, the United States exported about $4.7 bill ion in banking services, which accounted for 3 percent of total services exports and about 4 percent of the total trade surplus. Less than

29 The UPS application to the FCC was unopposed; the company is thought to be strategically positioning itself to provide a value-added international network for customers, in the future. Tashkovich, op. cit., footnote 21.

29 The network will operate at 19.2 kbps, with the expectation of higher speeds when the TCP/I P protocol is brought *into the* system.

[30] "Freedom of Choice," Communications Week *International*, Apr. 6, 1992, pp. 18-19; also "MCI VSAT Push," p. 1, and "No Turning Back," Editorial, *Communications* Week *International*, Apr. 6, 1992.

[31] The case study on which this section relies has been separately published. See U.S. Congress, Office of Technology Assessment, *U.S. Banks and International Telecommunications*, OTA-BP-TCT-1OO (Washington, DC: U.S. Government Printing Office, September 1992).

a score of U.S. banks actively compete in European markets; middle-sized and smaller banks serve their domestic customers' overseas needs through correspondent banks and the use of shared networks such as SWIFT and CHIPS.

Banks operating overseas use networks in two ways: for intracorporate business support such as might be used by other large multinational corporations-voice, data transmission, fax, electronic mail (E-mail) and voice mail—and as a means to create and deliver financial products and services. U.S. banks say that they have many disadvantages in European markets,[32] but that American computer and communications technology has nevertheless given them offsetting advantages. Their competitive edge has been the ability to create and supply innovative value-added financial services.

U.S. banks maintain a competitive edge *in creating and supplying innovative value-added services.*

During the 1980s, several U.S. banks aggressively developed global networks with packet switches, multiplexer, and multiprotocol bridges/routers to connect local area networks (LANs) and wide area networks (WANs) serving their dispersed facilities. Alternatively they used third-party services providers to interconnect LANs with X.25, TCP/IP, frame relay, or other fast data transmission technologies.[33] Recently there are signs that U.S. international banks are moving toward greater user of public-switched networks or hybrid networks, sometimes outsourcing their own networks. One reason for this move is to reduce the costs of maintaining network management personnel; a more positive driver is the availability since 1990 of virtual private networks, less expensive than traditional leased line networks because they make more efficient use of network facilities by dynamically allocating dedicated lines to customers on demand.

In addition to private networks, banks use several shared networks or third-party networks for credit authorization and validation, and for payments and settlements. These include SWIFT, CEBAMAIL, MasterCard International, VISA International, and payment netting systems. The most widely used is SWIFT (the Society for Worldwide Interbank Financial Telecommunications), which has over 1,800 member banks and links over 3,000 financial institutions in 84 countries. SWIFT is currently being upgraded to offer EDI services, a netting service for banks trading in European Community units (ECUs), and the automatic matching of foreign exchange and money market transactions. CEBAMAIL is a data network established by European central banks.

32 They are generally smaller and less diversified than foreign competitors as a result of U.S. laws and regulations originally designed to prevent monopolistic aggregation of financial capital and power. By U.S. law, national banks can conduct foreign lending operations only through chartered subsidiaries (Edge Act corporations). American banks lack the close corporate ties enjoyed by the banks of Japan, Germany, and some other nations. U.S. corporations increasingly bypass banks to raise their own capital through commercial paper. Moreover, retail deposits have been migrating to nonbank competitors such as mutual funds. U.S. banks have been hurt recently by the large U.S. trade deficit, a low savings rate, and losses on developing countries debts and on commercial real estate. Finally, banks are usually at some disadvantage outside of their own domestic markets because of language and cultural differences.

33 For example, Chemical Bank has a private international network for intrabank messages but outsources all telecommunications related to cash management services, to the General Electric Information System (GEIS). Both U.S. and European banks may use IBM's International Network and DIAL service to communicate with each other and with the Bank of International Settlements in Basel, Switzerland.

Increasingly, international banks want to have access to technologies such as Integrated Services Digital Network (ISDN), frame relay and Switched Multi-megabit Data Services (SMDS), EDI,[34] and electronic document imaging. They want more efficient forms of packet switching to squeeze more out of their existing networks. Frame relay and SMDS are especial] y important for high-speed data transfer and to let financial institutions send bulk data in irregular bursts. Electronic document imaging is a promising way to computerize and use old paper records as well as to store and transmit current documents.

As users of international telecommunications networks, banks are especially concerned about data security and reliability; they are threatened to varying degrees by criminal actions, human error, and systems failure. Yet banks are reported to be laggard in demanding from carriers, or providing for themselves, badly needed security safeguards such as encryption technology, in part because of the costs and in part because of a long-standing dispute with the U.S. National Security Agency about the role of the U.S. intelligence agency in defining standards for this technology.[35]

Financial institutions find, in some countries, that they have special regulatory problems beyond those that affect all telecommunications user groups. In most countries both banking and telecommunications[36] are regulated industries and banks with private networks may run into a double regulatory burden. In some countries, electronic funds transfer, credit card authorization, and switching for automatic teller machines (ATMs) are considered telecommunications services

[34] EDI is both a competitive threat and a technological opportunity. Provided by third-party service providers, ED I Intervenes between banks and their tradit ional clients so t hat the bank provides little or no value-added service and might be able to charge only commodity prices for passing money through its system. A corporate EDI system, or an ED I system operated by a third-party services vendor, can continually net transactions between companies and their suppliers and customers, with consolidated payments to each at the end of the day; this would greatly reduce the role of the banks. However, the banks themselves can move to become ED I hubs, adding this to their existing cash management services and offering the advantage of their abilit y to transfer funds (i.e., make final payment, which nonbanks cannot do) and their com puterized processing capabi I it y. To take advantage of t his, banks wi II have to participate activel y in t he rapidly progressing development of EDI standards.

35 In the 1980s, the Reagan Administration expanded the military/intelligence role in communications and data securit y, and the National Secunt y Agency was given responsibil it y for certifying cryptographic designs for use by U.S. companies. Concerns about costs and availability and about the appropriateness of such a strong role for a military intelligence agency in corporate Information security have persisted.

[36] Computing and communications technology has greatly benefited banks but has also encouraged telecommunications companies and Information services vendors to compete with banks in offering financial services. For example, the AT&T Universal Card provides general consumer credit as well as calling privileges. Telecommunications companies increasingly offer cash management functions for their large business customers and home banking for residential and small business customers. They are also moving to provide electronic trading systems for government bonds, currencies, and derivative financial products. The large customer base and well-developed billing systems of telecommunications companies maket heir competition a strong threat to banks. See U.S. Congress, Office of Technology Assessment, *U.S. Banks and International Telecommunicati inns,* OTA-BP-TCT-1 00 (Washington, DC: U.S. Government Printing Office, October 1992).

Architectural, engineering, and construction services are typically not big users of international telecommunication because of tradition and unintegrated industrial structure.

and are so regulated. Cash netting and cash management services for multinational corporate clients may have particular problems-most such systems accommodate some message transmission in the form of instructions or explanations, but some foreign regulators consider this to be resale, or an unlawful messaging activity by the banks. It may not be clear whether an online transaction is a regulated banking service, a telecommunications service that is regulated in some jurisdictions, or an unregulated data processing service. ATM networks or other shared networks may also be held to violate antitrust regulations or other policies designed to require competition,

While they may face dual regulation in some countries, a few U.S. banks have also used international networks to escape regulation and taxation, by locating offices or branches "offshore '' in countries with few or no regulations. This allows them to engage in '"money laundering' and other forms of illicit or unethical behavior.

Construction services[37]

Not all services exports are at present highly dependent on international telecommunications. Architectural, engineering, and construction services, sometimes called AEC services, show relatively little reliance on telecommunications now, but in the future, information technology and telecommunications networks could lead to significant expansion of exports, which is unlikely to occur otherwise.

This sector is highly fragmented across disciplinary lines: most firms offer either architectural design, engineering design and consulting, construction and construction management, or a combination of two of these.[38] Although referred to as AEC firms, in reality there arc few integrated companies that offer the full range of services. A given facility's construction project almost always is conducted by a number of contractors and subcontractors working for, but usually not closely managed by, a developer.[39]

The pace of internationalization in the AEC industry has quickened since the mid-1970s. The international market for such

37 This section relies on an OTA contractor report: Deborah Workman, "Emerging Applications of Information and Telecommunications Technologies in the U.S. Construction Services Industry," October 1992.

38 Some classifications include facilities management in this sector. The AEC industry is characterized by a few extremely large firms, a modest number of mid-sized firms, and a great number of very small firms. Ninety-seven percent of all U.S. AEC firms employ fewer than 50 people, and 90 percent have fewer than 20 people.

39 In the United States, the AEC sector includes nearly 1 million establishments, employs nearly 10 million people, and accounts for 8 percent of gross national product, with $400 billion in new construction in 1991. Workman, op. cit., footnote 37. Construction value statistics are from the U.S. Department of Commerce, *Industrial Outlook 1992.* Export statistics are from the Bureau of Economic Analysis, Survey *of Current Business,* September 1992. According to Workman there is no single comprehensive source of statistical measures for the U.S. construction industry. The data used in this section is drawn principally from *Engineering News Record's* annual ranking of the top firms and from U.S. Government reports, which, however, also often rely on the *Engineering News Record.*

services, in 1991, was about $130.2 million.[40] About 25 percent of this was in Europe.[41] AEC services accounted for less than 1 percent of U.S. services exports in 1991, producing revenues of $1.3 billion, and contributed 1.9 percent of the U.S. trade surplus, Nevertheless, U.S. firms win 36 percent of all engineering and construction contracts awarded around the world to nonnational firms, and they take 41 percent of architectural design contracts.[42] European firms win 43 and 46 percent, respectively. In the European market, U.S. firms get nearly 44 percent of nonnational awards for construction and 56 percent of design contracts; other European but nonnational firms win 50 and 40 percent, respectively.[43] U.S. firms are strongly competitive in Europe, and European firms are their chief rivals both in Europe and in the rest of the world.[44] The United States leads its closest individual rival, the United Kingdom. by a wide margin. But even though the value of their foreign billings has continued to rise, U.S. firms have lost market share over the last decade.

The AEC industry now makes very limited use of telecommunications networks, and especially of international networks. This is not principally because of costs or band with limitations but because the industry's traditional procedures have not been conducive to wide area networking and because of the peculiarly non integrated structure of work units. Most firms hold to the philosophy that they cannot "compete from home and need a presence abroad. Overseas projects arc typically managed overseas with relatively little dependence on oversight from the home office. Several contractors, providing services ranging from design through procurement to construction, typi-

40 The "international market" is taken to be the sum across countries of the value of contract awards to nonnational firms.

4 The United States was the site for about 12.7 percent of such awards.

42 U.S. firms captured $44 billion in overseas construction services in 1990 and $3.7 billion in architectural design billings. The latter rose in 1991 to $4.2 billion (1991 billings from engineering and construction contracts are not yet available). *Note the apparent discrepancy* between these figures, supplied by the *Engineering News* Record and checked with analysts at the International Trade Administration in the U.S. Department of Commerce, and those given above for total U.S. exports of AEC services ($1.3 billion in 1990), supplied by the Bureau of Economic Analysis. The explanation Is that the figure for billings, provided by the AEC firms, often includes multiyear contract awards, large umbrella contracts in which much or even most of the work is subcontracted to European firms, contracts awarded to multinational consortia led by U.S. firms, etc. The Bureau of Economic Analysis (BEA) figures are more restrictive, representing the money that flows to the United States. However, both sets of figures depend heavily on self-reporting and are subject to many distortions common to all figures dealing with trade in services.

43 In construction, Japanese firms win about 14 percent of international contracts, and 4.4 percent of European contracts. In design services Japan is not, currently, a strong competitor; it takes just over 3 percent of the total international market, none of the European market, and under 9 percent of the Asian international market. "Other" (not European, U. S., or Japanese) firms take 6.6 percent of the total international market for construction and 9.7 percent of the international design market.

44 U.S. AEC services overseas are predominantly concerned with infrastructure, industrial facilities, and environmental work. The largest projects undertaken by U.S. International design firms are probably industrial/petroleum projects, which have an average value of about S300 million. Workman, op. cit., footnote 37.

cally work on a project, but coordination is mostly done on the site to minimize the inefficiencies that result from fragmentation, Sometimes a client will demand that the various contractors create a common technology platform for project communications and information exchange, but this is rare at present. A few firms are now beginning to integrate—that is, to present themselves as full AEC firms with a complete range of services. This integration at the firm level may stimulate demand for integration of information systems that support these varied functions.

Information technology and telecommunications will someday transform this industry. The earliest stages of construction consist almost entirely of generating and sharing information: formulating client goals and plans, creating architectural designs, developing specifications, identifying and communicating legal and budget guidelines, checking standards and codes, making engineering shop drawings, etc. Yet, much of this work is still done by exchanging paper. At the next stage, a major problem is managing procurement and scheduling construction so that there are no delays to cause resources to remain idle. Change in architectural or engineering design during the project requires major changes in material procurement needs, yet supplier input must be current, complete, and quickly accessible. Financial managers must monitor project expenses and release funds on schedule. The technology exists for thoroughly transforming the work through integrated databases, interactive three-dimensional computer assisted design (3-D CAD),[45] and greater use of telecommunications.

But the adoption of advanced information technology in this industry has been very slow because of its costs, its human resources demands, industry fragmentation, and inadequate telecommunications.[46] Five or six of the largest U.S. AEC firms, especially Bechtel, are experimenting with 3-D CAD and have found that even dedicated 56 kbps links produce inferior results; well over 100 kbps or even megabit speeds will be needed. These links may be available in the future between major cities in this country and Europe, but large construction projects such as petrochemical or nuclear plants most often occur in rural, sparsely populated areas where such telecommunications are least likely to be available.

The number of U.S. AEC firms that now use advanced international telecommunications is therefore small. Probably only about 140 U.S. firms are engaged in foreign competition and the top dozen of these account for nearly 90 percent of all U.S.

45 This is three-dimensional imaging of the facility to be constructed. At its most advanced, 3-D CAD would allow continual updating and interactive modification at dispersed computer locations. This 3-D imaging would guide procurement, scheduling, and construction management throughout the project and allow continuing adaptation to or better coping with changes in weather, materials availability, human resource availability, and environmental factors.

46 There are other barriers, even stronger at present, including the lack of suitable software and protocols to support information-sharing in a multivendor environment. The largest firms, perhaps the top 20 U.S. firms, may lead in the adaptation of this technology for the industry; but because together they may have fewer than 150 major project offices in the United States, the market generated by their needs may not be sufficient to drive development. Workman, op. cit., footnote 37.

foreign billings.[47] Currently, small AEC firms require nothing more than one or a few standard voice lines for voice, fax, and low-speed modem communications. E-mail is popular and there is some experimentation with EDI. Sometimes clients install special temporary communications facilities for the duration of the project to connect the client firm, AEC vendors, and the project site. The transfer of 2-D CAD files is usually done by physical delivery of software copies. The firms with European operations tend to connect one major European office, most often London, to the U.S. headquarters for c-mail traffic and data related to financial management and business development. The link may be used occasionally to transfer 2-D and 3-D CAD files in batch mode.

The firms with significant international billings, among the largest U.S. AEC firms, typically need to connect four to six major U.S. locations and two or three foreign locations for exchange of corporate and engineering data. Most of their U.S. sites arc connected with 56 or 64 kbps, sometimes on public-switched networks and sometimes leased lines with bridges, routers, and multiplexers. The networks of the largest firms usually support TCP/IP, SNA, and DECnet traffic. X.25 may be losing ground to these competitors but it remains important as a network access protocol.

Those firms that are subsidiaries of large conglomerates usually have the widest range of technology options; they may have private frame relay backbones, and even 384 kbps videoconferencing.

The competitiveness of U.S. AEC firms in Europe is little affected, at this time, by telecommunications availability or costs; other factors are much more important, including financing of foreign projects, distribution of information about foreign contract opportunities, education of technical personnel, software standards development, and most critically the fragmentation and lack of coordination within the industry. The latter hinders the adoption of modem information technology that would enormously enhance the creation, sharing, and coordination of design and the complex tasks of coordinating and managing the construction process, which in turn would also help lower costs and increase industry competitiveness and profitability. However, as the more immediate problems of financing projects and integrating the industry are addressed, greater information-sharing will result within the industry, leading to greater use of domestic telecommunications networks, and ultimately to more use of international networks, This progression may become significant before the end of this decade if obstacles constraining the usc of advanced information technology within the industry can be overcome.

Information technology will someday transform this industry, as firms see advantages *in sharing information, designs, and schedules electronically.*

Policy issues

U.S. services exporters want more involvement of U.S. telecommunications firms in Europe, and greater availability of U.S. telecommunications and information services. This requires, as they see it, U.S. Government pressure on European countries to further open their telecommunications markets. According to some user firms, it also may require full domestic deregulation of telecommunications so that U.S. carriers will have the incentive to ''maximize information-based services.

47 The 10 largest U.S. firms consistently rank among the top 20 firms worldwide.

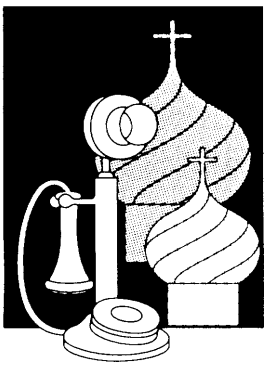
Specifically, government intervention is wanted to negotiate the end of restrictive ‘‘homologation’ (equipment approval or certification) practices that inhibit the deployment of U.S. equipment and thereby access to, or the ability to offer, innovative information-based services.

Service providers that rely on international telecommunications networks seem universally to want more international standards. Many favor a stronger role for the U.S. Government in standards development. Some firms see the need for government intervention in standards-setting to discourage European standards organizations from adopting standards that would shut U.S. firms out of European markets, or that would delay network interconnectivity. Some user firms said that government involvement might be necessary to push U.S. manufacturers, as well as European manufacturers, to agree to global standards.

User firms have come to realize that they have interests to protect in the process of standards development, and some arc demanding the right to participate in the process. At the same time, pallicipation incurs significant costs, that relatively few large user firms have been willing to assume. For example, financial institutions increasingly want to be included, yet in many banks senior managers with little understanding of technology are reluctant to approve costly participation in standards development.

Telecommunications in Central and Eastern Europe

CHAPTER 6



Successful development of market economies and democratic governments depends on modern telecommunications

THE DRAMATIC POLITICAL DEVELOPMENTS that have transformed Central and Eastern Europe (CEE) appear to be closely linked to communictions. Radio and television broadcasting provided a window on Western democracies and markets, and their appeal proved difficult to resist compared to Stalinist central planning and political structures. Many observers predict that the successful development of competitive market economies and free democratic organizations will depend critically on the installation and availability of modern telecommunications services. ''Improved communication channels will assist the free flow of information and stimulate economic growth."[2]

Improved telecommunications capability is presumed to be positively correlated with economic development, the strengthening of democracy, the broadening of culture, and greater educational opportunities. However, exactly how telecommunications fits into economic, social, and political development is often not placed in context. The absence or dilapidation of the telephone network is not the only problem in Central and Eastern Europe; many other urgent needs, such as energy production and environmental cleanup, will require attention and resources. Thus telecommunications, while critically important to these countries, competes with other needs.

Each country has distinct political and economic characteristics that lead to differing strategies on future economic development, legislation, and the role of private enterprise.~ The challenge these governments face is to carefully match their societies' communications needs with the desired characteristics of their economies, societies, and politics, in order to facilitate the transition from centrally planned socialist regimes

1 "Finding Their Voice, " *The* Economist, Feb. 8, 1992, p. 74. See also "Please Stand By," report of the State Department Task Force on Telecommunications in Eastern Europe. Observers say that the telephone, the fax, and the photocopier were critical in the erosion of Soviet control. James O'Toole, "Information and Power: Social and Political Consequences of Advanced Tele/Computing Tech nology," *The Aspen Institute Quarter/y, vol.* 3, No. 4, autumn 1991, pp. 42-73. O'Toole notes that "the unprecedented events in the communist world were seized upon . . as illustrative of the positive consequences of the new information tech nologies," but cautions t hat technology is not a driver—as it is often port rayed—so much as an enabler: "new technologies are *capable* of [dest roying power st ruct ures] if humans choose to apply t hem to t hat end" (P. 44). Further, O'Toole argues that the "bimodal characteristics" of new communications technologies—i.e., they are simultaneously centralizing and decentralizing, empowering and controlling-are rarely well understood: "It would require an unconscionable act of Intellectual selectivity to portray technology as simply either the defender or usurper of freedom" (p. 43).

2 "Central and Eastern Europe: The Problems of Reconstruction," *Telecommunications*, October 1991, p. 158.

3 For example, Erno Pungor, the Hungarian minister responsible for technological development, told the Office of Technology Assessment (OTA) t hat while telecommunicate ions was clearly im port ant to economic development, energy and environmental problems will also require significant resources. Presentation at the Hungarian Embassy, Washington, DC, Dec. 11, 1991. A theme running through the 1991 International Telecommunications Union Regional Development conference in Prague was the question of how to emphasize government assistance to telecommunications. U.S. concerns at the Conference were, as a consequence, to discourage the participants from establishing too strong a role for anticompetitive State telecommunications monopolies.

to market-oriented capitalism. Developing a telecommunications modernization strategy is one step.

In the past, public telecommunications has not been a priority in these countries. Information has been tightly controlled, and development of public telecommunications rigorously curtailed. As a consequence, telecommunications networks cannot meet the requirements of contemporary social and economic interaction. Recognizing the critical importance of communications to economic activity, however, most of these countries have begun to develop ambitious plans for basic telecommunications system expansion and modernization.[4]

This chapter will characterize the state of telecommunications in the CEE region and discuss strategies for modernizing the networks, in order to identify implications for the telecommunications industry and policymakers in the United States. Growing ties between East and West are making effective telecommunications critical for the conduct of business and public affairs. The chapter concludes, however, that the U.S. Government, and in particular the U.S. Congress, has little leverage over developments in those countries, apart from trade, foreign aid, and technical assistance tools already in use.

Defining and characterizing Central and Eastern Europe

Eastern Europe has for many years been the shorthand reference for those countries in the political/military and economic sphere of the Soviet Union,[5] i.e., under the Warsaw Pact and the Council for Mutual Economic Assistance (CMEA or Comecon). Comecon was the economic trading bloc set up by the Soviet Union (Comecon is now defunct). For the most part, Eastern Europe was usually defined by geography (see figure 6-1). The countries of the region themselves refer to the area as Central and Eastern Europe, which conveys a degree of differentiation to which the United States has until recently not been sensitive. Though there is consensus that Poland, Hungary, Czechoslovakia,[6] Romania, and Bulgaria are members of this group, there is some ambiguity about how to classify other countries, such as Albania, the republics of the former Soviet Union, and the

[4] The most advanced planning is in Hungary, Czechoslovakia, and Poland; Bulgaria and Romania have also begun to develop plans. Albania lags behind. While Yugoslavia had been actively modernizing its network, the breakup of the republic has disrupted these efforts.

[5] The original signatories to the Warsaw Treaty of Friendship, Cooperation, and Mutual Assistance signed in May 1955 Included Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the Soviet Union; China was an observer to the conference. Albania, however, formally withdrew from the treaty following the 1968 invasion of Czechoslovakia, for which it refused to commit troops. Romania, too, did not participate in the "Prague Spring" invasion and began to distance itself from the Pact.

[6] Czechoslovakia, or more formally the Czech and Slovak Federal Republic, was split into the Czech Republic and Slovakia in January 1993, following a national referendum on the political future of the Federation. The term Czechoslovakia will be used here where appropriate.

[7] Because Yugoslavia was not a full member of Comecon, it was not always considered part of Eastern Europe. At the time of this writing, the status of Yugoslavia is highly uncertain. The disintegration of the Soviet Union and the independence oft he Baltic republics has occurred so recently that t hey have onl y just begun to act as independent nations. Until its integration into the Federal Republic of Germany in 1990, the German Democratic Republic (formerly East Germany) was considered part of Eastern Europe.

remains of Yugoslavia.[7] In effect, Eastern Europe is as often determined by politics and economics as by geography. For the purposes of this chapter, the focus is mainly on the countries that were not part of the former Soviet Union.

Regional differences

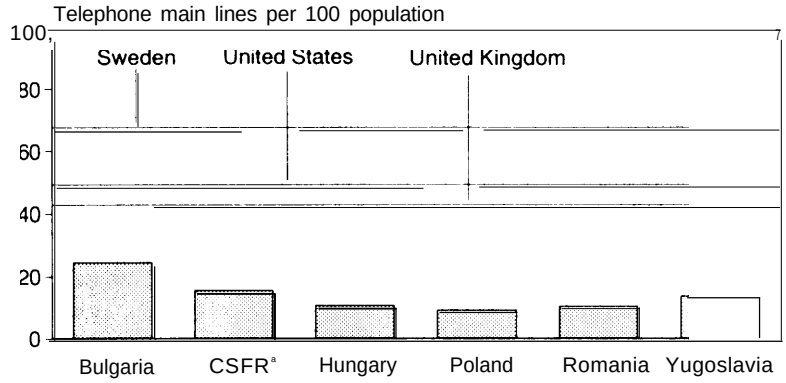
Because the economic and political ties between the United States and the countries of this region are growing, it is necessary to be sensitive to the significant differences among and between the countries, especial] y regarding their economic transformation. Czechoslovakia, Poland, and Hungary are expected to move successfully toward modern market economies and democracy. Both the European Community (EC) and the European Free Trade Association (EFTA) have negotiated trade agreements with these three countries, anticipating eventual integration within the economic and political West.[R] The United States has begun to view them as it does other trading partners; the United States Trade Representative (USTR) annual report on foreign trade barriers listed Poland, Hungary, and Czechoslovakia for the first time in 1992.[9] President George Bush extended to Hungary and Czechoslovakia permanent most-favored nation (MFN) status in April 1992; this had previously been

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

Figure *6-1. Central and Eastern Europe*

[8] Poland, Czechoslovakia, and Hungary signed similar declarations of intention with both the EFTA and the EC, that stipulate a 10-year transition period eventually leading to free trade. The three countries "signed agreements forging closer commercial and political ties" with the EC in December 1991, which will dovetail with EFTA negotiations, which are expected to be made official in the spring 1992. "EC-Central Europe Association Agreements Signed," *Europe Now, A Report,* U.S. Department of Commerce, International Trade Administration, winter 1991-92, p. 4. "EFTA Hopes to Sign Free-Trade Pacts With Three Eastern Nations by April," *International Trade Reporter, vol.* 9, No. 10, Mar. 4, 1992, p. 404.

[9] Eduardo Lachica, "Report on Trade Barriers Says U.S. Made Some Inroads in Japan, Mexico," *Wall Street Journal*, Mar. 30, 1992, p. Al 8. The *New York Times* notes that the USTR's annual report, which is required by Congress, is "a propaganda exercise" as well as a harbinger of Impending trade investigations. Keith Bradsher, "U.S. Adds 7 Countries to Trade Barrier List ," *New York Times,* Mar. 30,1992, p. D2. Meanwhile, Czechoslovakia, Poland, and Hungary are reducing and in some cases eliminating tariffs on products imported from the EC, in accordance with association agreements between the EC and the countries. "C..S.F.R. Tariffs on EC Exports Reduced, El im inated Under Agreement," *International Trade Reporter, vol. 9, No. 13,* Mar. 25, 1992, p. 536.



SOURCE: ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, INTERNATIONAL TELECOMMUNICATION UNION, 1992.

Figure 6-2. Telephone Penetration Levels: *A Comparison* (1991)

a Czech and Slovak Federal Republic

subject to annual review. 10 The prospects for MFN status for Albania, Bulgaria, Romania, political units of the former Yugoslavia, the Baltic republics, and republics of the Commonwealth of Independent States and Georgia arc less clear.

legacy of Soviet economic and trade policies

The West generally had a false perception that the countries behind the Iron Curtain were economically and socially integrated. The Soviet Union-dominated trade bloc, Comecon, was dissolved in January 1991 under pressure from the countries of Eastern Europe to substitute the barter system with a hard-currency-based trading system. While some trade and professional bonds were forged as a result of years of participation in Comecon, [11] overall the structure of trade within the organization minimized the economic interaction between the countries and instead imposed a system in which the Soviet Union supplied these countries with energy and raw materials and in return they sold manufactured goods back to the U.S.S.R, The pattern of international telephone lines shows clearly the lines of dominance, and the extent to which the individual countries of Comecon were cut off from one another.

The former Soviet Union used its energy supply to force a set of bilateral barter trading systems on the CEE nations. ' [2] The Soviet Union exchanged cheap oil and other raw materials for machine goods and food, and coordinated the trading of manufactured goods throughout Central and Eastern Europe. [13] Early in the democratization process begun in 1989 it became apparent that as the Soviet economy deteriorated, CEE econom-

[10] "President Signs Measure Extending Permanent MFN to Hungary, C. S. F.R.," *International Trade Reporter,* vol. 9, No. 16, Apr. 15, 1992, p. 700.

[11] Comecon consisted of Poland, East Germany, Czechoslovakia, Hungary, Romania, Bulgaria (Yugoslavia part icipated as an associate member), as well as Mongolia, Cuba, and Vietnam. A Congressional Research Service report suggested that being behind the Iron Curtain together for many years spawned fairly close and collegial relationships among the nations of the region. See Francis T. Mike, "East European National and Ethnic Relations in the 1990s," *CRS* Review, vol. 11, Nos. 3-4, March-April 1990, p. 13. In spite of the tremendous ethnic tensions t hat characterize the region now, and have for centuries past, it maybe t rue that Comecon tempered t hese ethnic and religious conflicts by forging professional ties where previously t hey did not exist. Now that Comecon has dissolved, some ties may remain among professional communities.

12 For a good discussion of how trade was handled within the Comecon system, see Martin Schrenk, "Whither Comecon?" Finance& *Development,* September 1990, pp. 28-31.

13 "Comecon: An Idea Whose Time Has Gone," *The Economist,* Jan. 13, 1990, p. 46. Pal Horvath, general manager and director general of the Hungarian Telecommunications Company, told OTA that over 70 percent of Hungarian telecommunications equipment was shipped to the Soviet Union. OTA interview, Budapest, Hungary, Oct. 7, 1991.

ics were being hurt as well, due to this trading system centered on Moscow. CEE countries now see that they must diversify trade relationships, with one another as well as with the outside world, if they want to develop rapidly.[14]

The condition of telecommunications in Central and Eastern Europe

Telecommunications in Central and Eastern Europe are in dismal disarray. Communications networks in these countries are several generations behind the West technologically and cannot provide the services required for these countries to achieve economic parity with the West. Though telecommunications operators are aggressively modernizing facilities for important business and government centers, these networks main] y rely on decades-old transmission and switching equipment, and have few international connections. even among CEE countries. Telephone penetration levels are low, the number of disconnections is high, and waiting lists for service are long.

Digital switching technology has only very recently been introduced. Most of the networks consist of electromechanical or semielectronic technologies, such as crossbar or step-by-step switches, that are antiquated by Western standards. For example, electromechanical crossbar switching technology comprised 47 percent of Czechoslovakia's telecommunications switching infrastructure in 1991, and electromechanical step-by-step switches accounted for 48 percent of capacity; only 3 percent of exchange capacity was digital, and nearly all of that was used in international service.[15]

Levels of telephone penetration are significantly behind those in Western European countries (see figure 6-2). '6 Bulgaria, with the highest telephone density of Eastern European countries, [17] in 1991 had approximately 25 main lines per 100 people, while

Central and European telecommunications cannot now provide services required for their countries to develop economically.

[14] Some observers advocated that foreign assistance to the CEE countries was best delivered via money sent to the USSR, which could then continue to buy goods and services from the CEE countries.

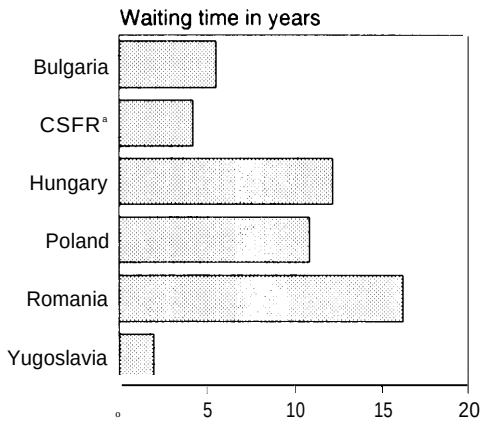
[15] Calculated from data in International Telecommunication Union, "Summary of the Survey on Present State and Plans for Telecom Development in Central and Eastern Europe," European Regional Development Conference (EU-RDS), Prague, Nov. 19-23, 1991, doc. no. EU-RDC-91/26-E (Geneva: International Telecommunication Union, 1991), table 3, p. 5, hereinafter referred to as ITU Summary.

[16] Comparative data in this report are drawn from International Telecommunication Union, *European Telecommunications Indicators*, European Regional Development Conference (EU-RDS), Prague, Nov. 19-23, 1991, doc. no. EU-RDC-91/46-E (Geneva: International Telecommunication Union, 1991), hereinafter referred to as ITU Indicators, 1990; and International Telecommunication Union, *European Telecommunications Indicators*, (Geneva: International Telecommunicate ion Union, October 1992), hereinafter referred to as ITU Indicators, 1991.

[17] ITU Indicators, 1991, op. cit., footnote 16, table 5, p. 5. This measure, which gauges the number of telephone main lines per 100 people, is the standard international measure for telephone penetration. As a rule, this measure fairly accurately depicts the relative development and extension of a country's communications network. Svetoslav Tinchev, chief expert, Digital Switching and Network Planning, PTT Ministry, Bulgaria, oral presentation, noted in "Report of a Seminar With Central and Eastern European Count ries," in *Policy Dialogue on Telecommunication Development: A Seminar With Central and Eastern European Countries,* held in The Hague, Apr. 22-24, 1991, doc. no. DSTI/ICCP/TISP(91)7 (Paris: Organization of Economic Cooperation and Development, June 4, 1991), p. 5.

Figure 6-3.
Waiting Time for
Telephone Service,
1992

[a] Czech and Slovak Federal Republic



SOURCE: INTERNATIONAL TELECOMMUNICATION UNION, 1992.

the average for the region was 13.[18] By comparison, the number of main lines per 100 people in the industrialized countries ranges from 34 (Spain) to 69 (Sweden), with the average for the developed countries of Western Europe at 43. Levels in Canada and the United States hover around 50. (See figure 6-2.)

As a consequence, waiting lists for connection are lengthening, and some areas have no service at all. In Poland, for example, the waiting list for a telephone grew from around 1 million in 1981 to 2.3 million in 1991. On average, waiting lists for the CEE countries increased by 9 percent a year between 1981 and 1990; in Western Europe these lists shrank by 12 percent over the same period. '9 The CEE average waiting time for telephone installation is 11.5 years and it is not uncommon to hear accounts of delays as much as 30 years, compared with less than 2 weeks in Western Europe. These figures probably understate true demand. which is likely to grow as the waiting lists shrink and people who were not bothering to sign up see better chances of getting connected. (See figures 6-3 and 6-4.)

Neglect is most critically manifest in the limited range and poor quality of services available. Lines only marginally reliable for basic voice service are unreliable for data and facsimile transmission. The number of annual faults reported per 100 lines ranged from 18 (in Croatia) to 97 (in Romania); by contrast, reports of faults in Sweden were 10 per 100 lines, in France 9, and in the United Kingdom 15. In Romania, 70 percent of calls were not completed, and in Hungary, 45 percent of local calls failed to go through. (See figure 6-5.)

Services available to businesses and residences are limited, but are growing fast. In 1990 there were only 28,000 fax machines in all of Central and Eastern Europe (compared with over 3.3 million in Western Europe), but by 1991 there were more than 72,000 (Western Europe had nearly 3,9 million in 1991). In 1990 Western Europe had 3.4 million mobile phone subscribers, and in 1991 4.3 million, while in Central and Eastern European countries there were only 4,500 in 1990, but 9,000 in 1991. Public packet-switched data networks are barely off the drawing boards in Central and Eastern

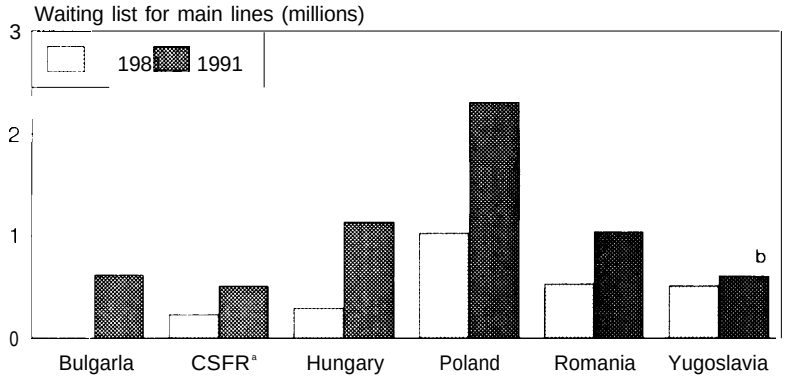
[18] Bulgaria expanded numbers of telephones at the expense of quality of service and infrastructure investment. For example, in 1990, 48 percent of local calls were not completed in Bulgaria, compared with less than 2 percent not com pleted in Western Europe; Bulgaria invested only $5.60 per capita in its network, compared with $20.00 per capita in Hungary and $132 per capita in Western Europe. These levels inmproved markedly by 1991: Bulgaria spent $28 per capita, Hungary spent $30, and the Western European average had dropped to $128. See 1990 data in ITU Indicators, 1990, op. cit., footnote 16, table 20, p. 20; and 1991 data in ITU Indicators, 1991, op. cit., footnote 16, table 30, p. 30.

[19] See data in ITU Indicators, 1990, op. cit., footnote 16, table 7, p. 7.

Europe, with 317 subscribers in Hungary and Bulgaria in 1990, but 761 in 1991, while Western Europe has an extensive X.25 service in place, with over 337,000 subscribers in 1991.

Finally, productivity of telecommunications operators varies a great deal between the two parts of Europe: in 1991, the number of main lines per employee in Central and Eastern Europe was 67, up from 58 in 1990, compared with 158 in Western Europe in 1991 and 152 in 1990.[20] (See figure 6-6.)

Services to rural communities have been especially poor. The telephone network is often concentrated in the major cities and administrative centers, so the outlying rural areas have much lower telephone penetration than suggested by the national averages.[21] For example, approximately 7,500 Polish villages arc without telephones, and nearly two-thirds of those villages with phones arc sevred by manual switches:[22] service effectively stops when the switchboard operator leaves for the evening. The same situation can be found all over Central and Eastern Europe. While several CEE telecommunications authorities have told the Office of Technology Assessment (OTA) that rural service is a priority, the focus of modernization thus far has been overwhelmingly on business users, on the presumption that businesses can absorb the increased costs.[23] (See figure 6-7.)



SOURCE INTERNATIONAL TELECOMMUNICATION UNION, 1992

Figure 6-4. Waiting Lists for Service, 1981 and 1991

a Czech and Slovak Federal Republlc
b 1990

The case of Hungary illustrates the condition of CEE telecommunications networks. The average wait for telephone connection over the past two decades has been 12 years, and even then there is considerable difficulty in securing a dial tone or in completing a call .[24] There were only 10.9 telephone main lincs per 100 people in 1991, and one source indicated that three-quarters of these are in the government.[25] Only 7 percent of switches were digital. While in the main cities 90 percent of lines had automatic switching in

20 Data for 1990 taken from ITU Indicators, 1990, op. cit., footnote 16; and ITU Indicators, 1991, op. cit., footnote 16, table 24, p. 24.

2 Jürgen Müller, "Closing the Capacity and Technology Gap In Eastern European Telecommunicat ions," European Regional Development Conference (EU-RDS), Prague, Nov. 19-23,1991, doc. no. EU-RDC-91/8-E (Geneva: International Telecommunication Union, 1991), p. 1.

22 Jürgen Müller, op. cit., footnote 21, p. 1.

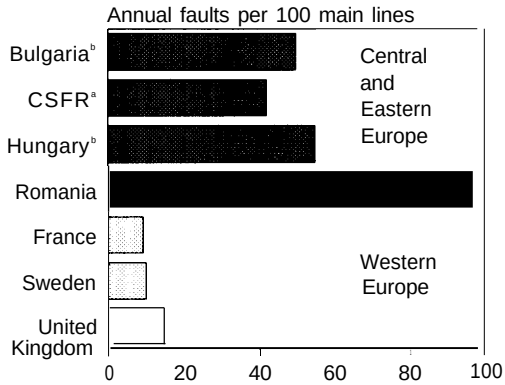
23 OTA interview with Pal Horvath, op. cit., footnote 13. Horvath claims this is demanded by Hungarian banks, whose loans provide 50 percent of the financing.

24 OTA noted on a trip to Hungary that want ads for apartments to rent usually specify "has telephone" even before mentioning how many rooms are in the apartment.

25 OTA interview wit h And ras Sugar, general manager, a nd John Handley, operations director, WESTEL (a U.S./Hungarian cellular telephone joint venture), and Jim Russell, manager of direct distribution, U.S. West Newvector Group (U.S. West is the U.S. joint venture partner in WESTEL), Budapest, Oct. 8, 1991.

Figure 6-5. Service Quality: Telephone Faults, 1991

[a]Czech and Slovak Federal Republic
[b]1990



SOURCE INTERNATIONAL TELECOMMUNICATION UNION, 1992.

1990, automatic dialing was available to only 50 percent of main lines in rural areas.[26]

> *In a great number of Hungarian villages the telephone provides a link with the outside world only in the daylight hours. . . 78 percent of the 2,024 main exchanges operating in Hungary at the end of 1988, for example, were manually operated exchanges representing 50 year old technology. . .[which means that] 78 percent of the locations in Hungary are not connected to long-distance dialing, 60 percent of the cities in Hungary are not connected to domestic long-distance dialing and 80 percent are not connected to international long-distance dialing."*[27]

Causes of decay

In the political environment of Central and Eastern Europe until recently, information was deliberately and tightly controlled and the development of public telecommunications services and facilities was rigorously curtailed. International and even much regional direct dialing was prohibited, circuits were extremely limited in number and quality, and telephone books were made classified documents.[28] Horvath of the Hungarian Telecommunications Company (HTA) told OTA that the Marxist government had deliberately neglected infrastructure and discouraged communications except among the few authorized decisionmakers. In the early 1980s there was a debate over the importance of telecommunications.[29] According to Horvath, the new leaders do not yet realize that poor communications ''is a deadly brake on the economy.

Telephony and other services were not considered industrial production in socialist economics and, since they had no quantifiable output, were seen as parasites on the real industrial economy.[30] Investment priorities

[26] OTA interview with Pal Horvath, op. cit., footnote 13. Horvath suggests that because more revenue will haveto be raised to cover operating and modernization expenses, rates will rise, and demand for telephone service will therefore fall. See also Eva Ehrlich, "Telecommunications Developments in Eastern Europe," Budapest *F/G YELO*, July 18, 1991 as cited in *JPRS Telecommunications Report,* Oct. 25, 1991, p. 57. The author notes that "there are only 'quasi telephones' " due to the unreliability of the vastly overloaded and outmoded network. The half million people on the waiting list for a main line connection in 1990 probably underestimates the true number of people seeking service by 50 to 80 percent.

27 Eva Ehrlich, op. cit., footnote 26.

28 Tim Kelly, "Telecommunications in the Rebirth of Eastern Europe," *The OECD Observer, No.* 167, December 1990, pp. 19-20.

29 OTA Interview with Pal Horvath, op. cit., footnote 13, confirmed by Peter Eisler, general manager, Hungirocom Telecommunications Ltd., Oct. 9, 1991, Budapest.

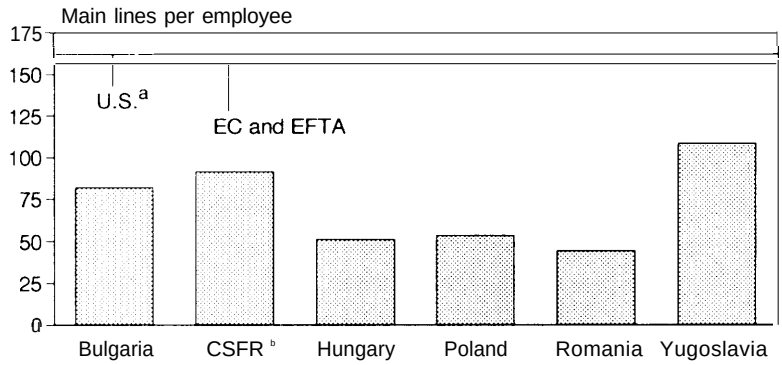
30 Measuring service productivity has been difficult for classical and neoclassical economics as well.

were not high for telecommunications services. (See table 6-1.) Much of the little spending that did occur, according to a World Bank study,[31] went to new lines rather than maintenance, so figures on CEE telephone density mask poor service and antiquated and nonperforming equipment, as the figures on line faults and completed calls show.

The network deteriorated as a result, necessitating the parallel development of ''closed purpose networks' for the more sensitive government activities such as the defense and interior ministries. For example, in the former Soviet Union three separate telephone networks existed: one for a very small circle of the political and military elite (for which special keys are needed), another for the party bureaucracy, and a third for the general public.[32]

Despite the lack of reinvestment, telecommunications nevertheless proved a reliable money maker. Following the traditional European model, telephone service in CEE countries was vested in Postal, Telephone, and Telegraph (administrations) (PITs), also responsible for postal and telegraph services and in some cases for broadcasting, and typically under the control of the ministry in charge of communications. (See table 6-2.)

As state-owned enterprises, telephone service operators, therefore, were both highly political *and* highly bureaucratic: telecommunications was used as a political tool for social and economic control, and telephone enterprises were bound by administrative public-service structures that prevented them from readily changing goals, strategies, or internal structures. Furthermore, telecommunications operators were closely supervised by finance ministries as they set prices and collected and distributed revenues. Telecommunications supported the postal service and contributed to the general treasury. Until recently, for example, the Czechoslovakian PTT turned over 87 percent of telecommunications profits to the general treasury.[33] The awakening of users to the value of communications has strained old telecommunications operating models in many countries. A major challenge to these countries will be to become much more responsive to users' needs.



SOURCE ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, INTERNATIONAL TELECOMMUNICATION UNION, FEDERAL COMMUNICATIONS COMMISSION, 1992.

Figure 6-6. *Telephone Operator Productivity, 1991*

a Local exchange carriers (regional Bell operating companies and the major Independents).
b Czech and Slovak Federal Republic

Regional relationships

Western approaches

Other aspects of telecommunications modernization are cooperation among countries in the region and assistance from international agencies. As noted above, for years the

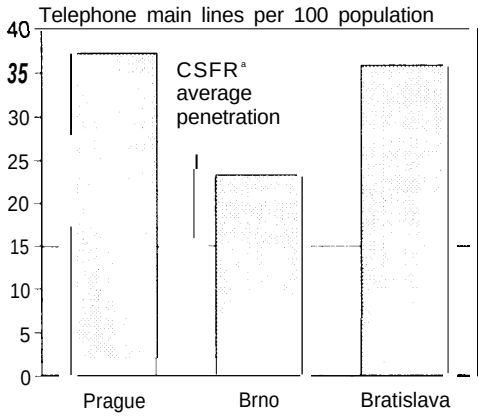
3 Timothy Nulty, *Considerations in Telecom Investment in Eastern Europe* (Washington, DC: World Bank, 1990).

32 Discussion with Gordon Cook, former OTA analyst and specialist on Soviet telecommunications networks.

33 Tim Kelly, op. cit., footnote 28.

Figure 6-7. Urban and Rural Service

a Czech and Slovak Federal Republic



SOURCE: INTERNATIONAL TELECOMMUNICATION UNION, AT&T'S THE WORLD'S TELEPHONES, 1991.

Soviet Union presided over a set of unilateral telecommunications arrangements with its satellites and limited their interaction with one another. In the mid- 1980s, the United Nations Development Program (UNDP) and the International Telecommunication Union (ITU) proposed to reduce this isolation by sponsoring a regional telecommunications development program, which became known as Euroteldev.[34] Its formal goal was to establish projects relating to new equipment, services, and network structures. Informally, however, it was intended to provide money and motivation for CEE telecommunications officials to begin to emulate the telecommunications world outside of the Soviet sphere.[35] Euroteldev has so far only produced plans, though those who have participated agree that its work should continue. Now that free political and commercial relationships between the East and West are possible, Euroteldev mission may however have less justification.

In addition, the ITU itself is attempting to play a larger role in helping developing countries modernize their telecommunications networks. Under the auspices of the newly created Bureau of Telecommunication Development[36] (BDT, after the French acronym), the ITU organized its second Regional Development Conference on telecommunications development in Central and Eastern Europe, which was held in Prague in November 1991 .[37]

The conference focused on four main areas: regulatory policy and structure of the telecommunications sector (i.e. privatization, creation of a separate regulatory body); telecommunications standards and network harmonization with Western Europe; needs for and sources of financing; and human resource training and development.

34 For a thorough description of Euroteldev, see John F. Healy and Ronald A. Davidson, *UNDP/ITU Evacuation Mission, European Telecommunications Development—Phase //,* Project RER/87/025, Evaluation Report (Geneva: mimeo, June 1991).

35 OTA interview with John F. Healy, project director, UN DP/ITU Evaluation Mission, Washington, DC, Sept. 17, 1991.

36 A High Level Comm ittee on the structure of t he ITU recommended t hat it be reorganized into t hree equal branches: telecommunications development, standards, and radio communications. The BDT is the successor to the Center for Telecommunications Development, which was an ancillary part of the ITU.

37 The first conference was held the previous year, in Africa, and the third was held in early 1992 in Latin America. Participating in the conference were officials from the telecommunications authorities of all the countries in Europe. Attending as observers, but with full participation in committees, were such countries as the United States, Canada, Mexico, and Japan, and such international organizations as Inmarsat, Intelsat, the European Commission, the Organization for Economic Cooperation and Development, the World Bank, and the European Bank for Reconstruction and Development.

The conferees agreed to create a working group of members from the subregion to jointly tackle issues left unresolved at the close of the conference, such as financing, network development, and human resources development. This group, the Central and Eastern European Telecommunications Cooperative Mechanism (CEETEC), builds on the experience of Euroteldev. Recent reports on these cooperative ITU activities suggest they are likely to move slowly .78 Most cooperative activities will occur on a company-to-company basis, as financing questions can be resolved.

	Average telcom investment, 1989-91 (US $ mil.)	Investment per capita (US$)
Bulgaria	160	28
Czechoslovakia	113	10
Hungary	195	30
Poland	42	4
Central and Eastern Europe	630	9
Western Europe	43,810	128

SOURCE INTERNATIONAL TELECOMMUNICATIONUNION(ITU), ITU INDICATORS, 1991, TABLE 30, P 30.

Table 6-1. Telephone Investment Levels, Comparing Hungary, Czechoslovakia, Poland, with United States and Western Europe

CoCom

Central to the telecommunications modernization plans of CEE countries is investment in advanced transmission and switching equipment. This equipment is not available from the former Comecon trading partners, but only from the Western countries. However, during the Cold War the West, through the Coordinating Committee on Multilateral Export Control (CoCom), established strict controls on the export of goods with military applications to Soviet-bloc countries and China.[39]

CoCom restrictions on importing high-tech communicantions equipment to the United States have, until very recently, hindered CEE governments in modernizing their networks, Telecommunications exports were a bitterly fought export-control issue within the Bush Administration and in other Western industrialized countries because of competing goals, military security, and free trade. Principally at issue are fiber optics and 32-bit digital computer processors, both of which may have military and civilian uses. Fiber optics permit vastly greater transmission capacity than coaxial copper c-able or microwave but are much more difficult to tap, which makes monitoring of military and military industrial activities more difficult.[40] CoCom has set a limit of 140 Mbps data transmission rate on systems installed between Russian cities, and 565 Mbps on systems terminating in some Russian cities, including Moscow, St. Petersburg, and Vladivostok. Intracity communications in restricted countries would have to continue using microwave or copper cables, [41] As late as 1992, this ban prevented U.S. West from constructing a trans-Siberian fiber optic network. According to officials in Hungary, however, Cocom should not now be a problem because the level of technology

38 Interview with senior State Department official, Washington, DC, Apr. 29, 1992.

39 CoCom consists of 18 countries: the NATO countries except Iceland, plus Japan and Australia.

40 Advanced digital processors are controversial because they could allowsignif icant advances incomputing speed for weapon design, targeting, encryption and other m ilitary operations.

4 In developing civilian telecommunications, reliance on microwave systems can be of great benefit, as the systems are capable of carrying substantial traffic, are well understood, are relatively inexpensive, and are easy to set up and reconfigure.

	Telephone revenues, 1991, (US$ mil.)	Revenues per capita (US$)
Bulgaria	112	12
Czechoslovakia	543	35
Hungary	533	52
Poland	520	14
Central and Eastern Europe	3,188	24
Western Europe	128,426	355

SOURCE: INTERNATIONAL TELECOMMUNICATION UNION (ITU), ITU INDICATORS, 1991, TABLE 28, P. 28.

Table 6-2. Telephone Revenues for Hungary, Czechoslovakia, Poland and/or CEE Average

presently available to them is acceptable and appropriate .42

In the United States, the Department of Defense and the various agencies of the intelligence community argue that maintaining CoCom restrictions is essential for national security. Firms such as AT&T, on the other hand, claim restrictions are no longer needed.[43] It appears that proponents of trade liberalization are prevailing. As it becomes apparent that Eastern European countries no longer pose a direct military threat to NATO (North Atlantic Treaty Association), the CoCom countries recently have taken a number of steps to modify their restrictions, in order to nurture new potentially lucrative trading partnerships.[44] Further, fiber Optic technology is becoming available to these countries. Because German firms are permitted to honor contracts made in the former East Germany, the former East German firm, Carl Zeiss, can export advanced fiber optic technology to the CEE countries and Russia. This loophole is putting pressure on CoCom members to modify the restriction.

Change is quickest for the three most politically progressive and stable countries, Poland, Czechoslovakia, and Hungary, which have begun to institute export control procedures that satisfy CoCom.[45] Hungary, which has had an export control regime in operation since October 1990, is the farthest along; CoCom agreed in May 1992 to remove Hungary from the list of proscribed destinations.[46] The prospect of relaxing or elinlinat-

42 Also, it was—and still is—a matter of national pride in Hungary, for example, to successfully circumvent the restrictions. OTA Interview with Erno Pungor, Hungarian minister for technological development, Washington, DC, Oct. 31, 1991.

43 Hearings in the 102d Congress before the House Foreign Affairs Committee's Subcommittee on International Economic Policy and Trade ventilated these arguments. OTA has not attempted to evaluate these claims independently, as this would require use of classified material. Subcommittee staff believe, however, that nothing they have seen in the record suggests that continued restrictions on high capacity fiber exports are warranted. OTA interview with John Scheibel, staff director, House Foreign Affairs Comm ittee's Subcommittee on International Economic Policy and Trade.

44 "U. S., Allies Preparing to Ease Curbs on Exports to Baltics, Other Countries," *International Trade Reporter, vol.* 9, Mar. 11, 1992, p. 434.

45 Some barriers remain for export to t he Commonweal h of Independent States, part icularly for systems to be used for internal traffic. "U. S., Allies Agree to Liberalize Telecommunications Exports to Ex-USSR," *International Trade Reporter, vol. 9,* Mar. 11, 1992, pp. 430-31.

46 This move is cent ingent on establishing new guidelines covering nuclear technologies and munitions and requiring that rest rict ions be placed on t he export of Hungarian technologies and goods as well. Previously, Hungary's export rules only restricted the reexport of high-tech goods to t he former Soviet Union and only targeted dual-use technologies. "Hungary to Comply Soon With CoCom Requirement for Freeing High-Tech Trade," *International Trade Reporter, vol. 9, No.* 10, Mar. 4, 1992, p. 390. The status of Poland and the Czech and Slovak Federal Republic (CSFR) was given more favorable consideration, but consideration of removal from the proscribed list is to be delayed.

ing bans on importation of high-tech goods is an important leverage to impel these countries to progress toward Western political and economic practices.

Efforts are underway in CEE countries to correct major structural flaws that have contributed to the disintegration of both the economic structure in general and the telecommunications sector specifically. Modernizing telecommunications" addresses only a single, but critical, element of the broader need for reform. In recognition of its fundamental importance to their economies, both as an industry in its own right and as a multiplier for other economic activities, the CEE countries are planning major organizational and legal changes. This liberalization is aimed at both improving the communications networks and creating an environment conducive to foreign financial and technical assistance for modernization.

The World Bank and the Organization for Economic Cooperation and Development (OECD) estimate that the total cost of modernizing will be around $50 to 60 billion over the next decade, and considerably more if the countries of the former Soviet Union are included.~' The ITU estimates that the cost for Central and Eastern Europe, including the former Soviet Union, would be $94 billion just to bring service levels to Ireland's current standard.[48] Expectations of improving penetration levels to Western levels by the end of the century arc ambitious, perhaps unrealistic; and these figures only represent additional lines, not replacements of dilapidated network and terminal equipment. (See table 6-3.)

How telecommunications modernization will be paid for is a difficult issue for all CEE countries, as their economies are relatively unproductive in world markets, their foreign exchange reserves are low, and their prospects for short-term improvements arc bleak. It is likely that some combination of self-generated revenues, capital raised in foreign markets and eventually from domestic markets as these develop, and foreign aid or loans, will be necessary.

The prospects for raising revenue internally from telecommunications service and allocating it for network modernization are not encouraging. Profits from telecommunications services generally arc returned to the general treasury, rather than being reinvested in telecommunications. Tariff structures in each country provide subsidies to local calls and handset rental charges, depriving the operator of revenues that could be used for network modernization.

CEE financial markets are as yet weak, and in some cases there is no other domestic

Modernizing telecommunications systems will cost about $50 to $60 billion. Who will pay is still unclear.

[47] The World Bank's project ion of costs is generated by a rough estimate of the average cost of installing a single telephone line (about S2,000) muliplied by t he number of add itional lines t hat the government/operator forecasts putting in. Timothy Nulty, *Considerations in Telecom Investment in Eastern Europe* (Washington, DC: World Bank, 1990). According to OECD's calculations, the $50 billion in investment necessary to Increasing the telephone penetration rate to levels on par with the West do not include the investment required to improve services. Moreover, this amount does not account for the former Soviet Union. See "Finding Their Voice," *The Economist*, Feb. 8, 1992; "Central and Eastern Europe: The Problems of Reconstruction," *Telecommunications*, October 1991, p. 158; and Tim Kelly, "Telecommunications in the Rebirth of Eastern Europe," *The OECD Observer, No. 167,* December 1990, pp. 19-20.

[48] "New St udy Says Eastern Europe, ex-USSR Need to Spend S94 Billion to Upgrade Phones," *International Trade Reporter, vol. 9, No. 41,* Oct. 14, 1992, pp. 1758-59. Ireland has one of the lowest telephone penetration rates in Western Europe, at 29 telephones per 100 Inhabitants.

BOX 6-A. U.S. WEST TRANS-SIBERIAN LINK PROJECT

CoCom restrictions have prevented a U.S. West-led consortium from constructing a fiber optic link across Siberia. One proposal is to lay a 565 mbit/second fiber line totaling 11,528 miles from Nakhodka, in the east, to Moscow, where the line would split, one branch going to St. Petersburg and Denmark, the other to Sevastopol and Italy; the deal is reportedly worth *$500* million. Currently, most of the European-Far East traffic goes across the Pacific, the United States, and the Atlantic. Sending calls across Asia would reduce the transmission length by 30 percent. With traffic between Europe and the Far East projected to rise by 15 percent annually, U.S. West estimates that the fiber line's full capacity would probably be completely used as soon as deployed. Furthermore, internal demand for both long-distance domestic and international telecommunications services is likely to be enormous.

With CoCom restrictions still in place, calls will likely be routed *around* Russia, with most of the network not within the country at all. High capacity links from certain Russian cities would send Russian calls to switching centers outside the country. The calls would then be routed to other switching centers, and then sent back into Russia via high-capacity 565 megabits/second fiber terminating links. Traffic continuing in Russia would be sent via high-speed microwave equipment (156 mbit/second), which does not violate CoCom restrictions. From the Russian point of view this is less desirable than a fiber link, but would improve substantially capacity and reliability while observing existing CoCom restrictions.

SOURCE: OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

source of investment capital than the government, either through the Treasury or the government-owned banks. International capital markets could be used, but the rules on investing are not yet clearly delineated. Horvath of the Hungarian Telecommunications Company (HTC) told OTA that he attempts to get financing as much as possible from Hungarian banks, but while HTC is a preferred customer, the banks' resources arc insufficient to meet HTC's needs. Horvath noted that there would be limits to foreign investment because Hungary is a small country, and it is already getting half of all foreign capital coming into Eastern Europe (of that, more than half comes from the United States). Aid money from the West and from multilateral lending agencies is not available in the amounts required. Estimates provided by telecommunications authorities to the ITU show that Hungary, Czechoslovakia, and Poland each expect 45 to 70 percent of modernization investment to come from internal sources, 15 to 35 percent from bank loans, and 10 to 15 percent from private sources, including foreign investment.~[9]

Thus, reform of telecommunications financing will involve several elements, First, it will be necessary to reform the PTTs in order to make them more responsive to private business needs. All the Central and Eastern Europe PITs arc slated to break into several parts, splitting the telecommunications, postal and in some cases, broadcasting operations off from the ministry, which will retain oversight and regulatory authority. At the same time, tariffs arc likely to be changed to bring prices more in line with costs, and to reduce telephone rental and local calling subsidies. Second, financial and regulatory

4. Calculated from data in ITU Summary, op. cit., footnote 15, chart, p. 3.

policies will have to be made predictable so that companies will conclude that it is not unduly risky to invest in these countries. Finally, privatization, as is projected in Hungary and discussed in other countries, will open telecommunications firms to private capital. Capital will be sought on domestic markets, as these develop, and on international markets, through the sale of shares in the national firm when the state sells off its assets. The need for external investment may entail a significant amount of foreign ownership, eithcr through share purchases of privatized firms, or through participation in joint ventures or other cooperative arrangement.

A number of CEE countries, especially Poland, Hungary, and Czechoslovakia, anticipate becoming members of the European Community, where they will be required to follow EC directives, including those regarding telecommunications. Several are already pursuing or intend to follow these requirements for liberalization in order to improve their prospects for membership. Additional pressure for liberalization or reform is coming from potential investors and financing sources, who, against the backdrop of general uncertainty about political stability, are reluctant to invest without the proper legal framework, especially regarding private property and repatriation of profit.[50]

Major sources of financing, such as the European Bank for Reconstruction and Development (EBRD) and the World Bank, are making liberalization a precondition to assistance. For example, the EBRD, which was created in 1990 specifically for the purpose of providing financial assistance in the transition to market economies,[51] lent $377 million (268 mill ion ecus) for telecommunications projects in Central and Eastern Europe in 1991, while the World Bank lent $270 million for telecommunications improvement to Poland and Hungary. The European Investment Bank provided an additional $211 million (150 million ecus).[52]

Table 6-3. Telecommunications Modernization, Main Lines and Investments, 1992-2000

	Main lines to be added from 1992-2000 (millions)	Estimated investments 1992-2000 (US$ bil.)
Bulgaria	.69	1.0
Czechoslovakia	2.6	3.8
Hungary	2.2	3.3
Poland	8.8	13.1
Central and Eastern Europe	24.2	36.3

SOURCE. INTERNATIONAL TELECOMMUNICATION UNION, *EUROPEAN TELECOMMUNICATION INDICATORS* (GENEVA INTERNATIONAL TELECOMMUNICATION UNION, OCTOBER 1992), TABLE 33, P.33.

Strategies for liberalization

Because Western Europe is looked at as a model for the newly emerging democracies,

50 Analysts are divided on this point. There may be some capital inflows to the region regardless of the legal uncertaint y: as one analyst pointed out to OTA, U.S. firms hope to hide behind t heir joint ventures with CE E enterprises, who, they say, will understand the laws and deal with t he regulators. OTA interview wit h Robert Bruce, attorney, Debevoise and Plimpton, Washington, DC, Sept. 23, 1991. A senior State Department off icial noted, however, that U.S. firms are still on the sidelines, by and large. OTA interviews, Washington, DC, Apr. 29, 1992.

51 On the initiative of the EC, 42 countries in May 1990 created the European Bank for Reconstruction and Development, a mult i lat eral bank modeled after t he World Bank "as a major vehicle for channeling Western resources into the reconstruction of the economies of Eastern Europe. " Holliday and Harrison, "The Economics of Reform in Eastern Europe," *CRS Review, vol.* 11, Nos. 3-4, March-April 1990, p. 26.

52 "Finding Their Voice," *The Economist,* op. cit., footnote 1.

*Table 6-4. Foreign Participation in Cellular Licenses of Eastern Europe **and the Former** Soviet Union*

Country/city	Partners	ownership	Award date	Comments
Czechoslovakia	Eurotel		1990	Eurotel wiI invest $60 million over next 10 years.
	US West (US)	24.5%		
	Bell Atlantic (US)	24.5		
	Czech & Slovak PTTs	51.0		
Hungary	WesTel		**1989**	To date, US West has invested $13 million.
	U.S. West (US)	**49.0**		
	Hungarian Telephone Company	51.0		
Poland	Polska Telefonia Komorkowa		1991	$50 million investment over 3-4 years. Reportedly, Ameritech and France Telecom paid $70-80 million for the license,
	Ameritech (US)	24.5		
	France Telecom	24.5		
	Polish PTT	51.0		
Romania	Nationwide Cellular (U. S.)	51.0	1991	
	Romanian PTT	**49.0**		
Russia				
Moscow	Moscow Cellular Communications		1991	Initial investment: $7 million.
	US West (US)	**22.0**		
	Millicom International Cellular Sweden (Us.)	**20.0** **50.0**		
	Ministry of Posts and Telecommunications	**8.0**		
	Fyodorov Eye Microsurgery Science and Technology Complex of Moscow			
	Euronet		1992	Reportedly awarded a test license by the RussIan military to operate an 800 MHz cellular system.
	Plexys International (US)			
	Information Transfer Technical System Center			
	(Russian Ministry of Foreign Affairs)			
	Vimpel Corp. (Russian military elextronics contractor)			
Russia				
St. *Petersburg*	Delta Telecom		1991	Priority connection to international gateway switch. $7 million investment.
	U.S. West (US)	40.0		
	St. Petersburg City Telephone Network	55.0		
	Production Association			
	St. Petersburg Station Technical Radio Control			
Ukraine	Ukrainian Mobile Company		**1992**	The consortium IS licensed to provide paging, analog cellular, GSM cellular and PCN services. Reportedly, PTT Netherlands has relinquished its stake to DBP Telekom.
	DBP Telekom (Germany)	16.3		
	PTT Telecom (Netherlands)	16.3		
	Telecom Denmark	16.3		
	Ukranian Government	51.0		

Country/city	Partners	Ownership	Award date	Comments
Estonia	Eestl Mobiil Telefon (EMT)		1990	Baltic Systems are interoperable with the Scandlnavian, Moscow, and St. Petersburg cellular networks.
	Telecom Finland	245		
	Swedish Telecom	24.5		
	Estonian PTT	51.0		
Latvia	Latvian Mobile Telephone Company		1991	
	Swedish Telecom	24.5		
	Telecom Finland	24.5		
	VEF (Latvia)	23.0		
	Latvian State Radio & Television Centre	23.0		
	Latvian Telecommunication Centre	50		
Lithuania	Comliet		1991	Comliet wiIl also establish international satellite link.
	Millicom International Cellular	490		
	(Sweden/U. S.)	41 0		
	Vilnius Telephone Network (Lithuania)	10.0		
	UAB Antena (Lithuania)			
Byleorussla	CommStruct international (U S)	50.0	1991	
	Byleorussian PTT	50.0		
Russia			Expected early 1993	Government has announced bidding for GSM Incenses in 12 Russian cities, including Moscow and St. Petersburg.
Uzbekistan	Uzbanrobita		1992	ICG is providing hard currency and operating expertise.
	ICG	45.0		
	Uzbek Communications Ministry	550		
Hungary			1993	2 nationwlde, 15-year GSM licenses, One IS reserved for Hungarian Telecommunications Company/foreign company joint venture; the other wIII be 100 percent private. Likely foreign bidders: WesTel for the HTC joint venture; BT, France Telecom, DBP Telekom consortium for the private license. Upfront $30 million fee and $1 million annual radio frequency usage fee,

SOURCE "INDUSTRY TRADE AND TECHNOLOGY REVIEW," OFFICE OF INDUSTRIES, U.S INTERNATIONAL TRADE COMMISSION, FEBRUARY 1993, PP 2-3

The European Community is the model for liberalizing Central and Eastern European telecommunications. However, much uncertainty has accompanied liberalization efforts, **and many are still** *incomplete.*

the EC telecommunications directives and the precedents established by EC member countries are a guide to the liberalization measures. For example, Czechoslovakia's new telecommunications law, passed in March 1992, is consistent with European Community directives.[53] In Romania, the EC Green Paper is also a guide for telecommunications liberalization.[54] As the senior legal analyst in the Hungarian Ministry of Communications put it recently,[55]

> *The intention of the Hungarian telecommunications policy is to follow the directives of the EEC [European Economic Community]. The reason for this is not only because it is a political aim, but also because EEC directives are based on large scale compromises between the various players, especially the pro- and anti competitive ones.*

Nevertheless, U.S. regulators feel they arc successfully communicating the elements of the U.S. regulatory structures, process, and philosophy to CEE telecommunications authorities. The recasting of the public telephone operators (PTO) relationship with the government is the critical first step to modernization. Modernization will be impossible so long as revenues from telephone service arc turned over to the government rather than reinvested in the network. Operators have been unable to raise domestic rates because of pressure from finance ministries, which respond to political pressure from users who would suffer if rates were raised.

Privatization is an opportunity for the government to raise much-needed funds and get large infusions of hard currency. The recent privatization of Mexico's telephone company is setting a precedent for CEE countries. Hungary, Poland, and Czechoslovakia have all separated the operator from the government in a carefully planned evolution eventually leading to privatization.[56]

This separation necessitates the creation of a regulatory agency. Under the old PTT system, no functional distinction was made between operations and regulation because

53 "Czechoslovakia Passes Law," *CommunicationsWeek International*, Apr. 6, 1992, p. 34. The law stipulates the creation of a regulatory body separate from the operator and anticipates competition in communications services, except for basic voice telephony, for which the service providers in the two republics (SPT Praha and SPT Bratislava) retain exclusive rights.

54 Dan Stenfanescu, "Telecommunications in Romania," paper in *Policy Dialogue on Telecommunication Development: A Seminar With Central and Eastern European Countries,* held in The Hague, Apr. 22-24, 1991, doc. no. DSTI/ICCP/TISP(91)7 (Paris: Organization of Economic Cooperation and Development, June 4, 1991), p. 2.

55 Krisztina Heller, "Regulatory Trends in Hungarian Telecommunications," European Regional Development Conference (EU-RDS), Prague, Nov. 19-23, 1991, doc. no. EU-RDC-91/13-E (Geneva: International Telecommunication Union, 1991), p. 1.

56 Privatization maybe accomplished in a variety of ways, and is a complex process for which governments in Central and Eastern Europe may be unprepared. Telecommunications attorney Robert Bruce told OTA that in Hungary, the debate on privatization also dealt with decentralization of telecommunications. Tim Nulty, senior economist at the World Bank, notes that developing countries should proceed slowly on privatization, and that a variety of "bottom-up" forms of privatization can occur without selling off the whole telephone network. See Timothy E. Nulty, "Telecommunications in Developing Countries: The World Bank's Perspective and Role," European Regional Development Conference (EU-RDS), Prague, Nov. 19-23, 1991, doc. no. EU-RDC-91/14-E (Geneva: International Telecommunication Union, 1991), p. 4.

the government was presumed to protect the general public good and ensure that social goals were met. Also, the distrust of monopoly that necessitated regulation in the United States theoretically did not exist in centrally planned economies.

A great deal of uncertainty has accompanied the drafting of new laws, despite the mode] of the 1987 EC Green Paper. The new Hungarian telecommunications law has been through many drafts, changing almost daily. The Polish bidding process for a foreign-owned new cellular network was nearly completed when the government decided to reverse legislation allowing 1 ()()-percent foreign ownership, instead requiring majority Polish ownership. -[57] political opposition to privatization in Poland and Czechoslovakia may constrain the types of services that may be privately provided.

Since several of the countries of the region aspire to economic parity with western Europe in short order, they are acutely concerned with the provision of advanced telecommunications services, such as high-speed data and mobile communications. This was one of four main issues highlighted at the ITU's Regional Telecommunications Development Conference. Business customers, especially those accustomed to Western standards of service options and quality, will need modern services and thus may shoulder much of the costs of modernization.[58]

The establishment of cellular networks has high priority, to supplement (or perhaps supplant) the existing public wireline networks for office communications as well as for mobile communication. Cellular networks are targeted first at incoming Western businesses and investors, to whom the dilapidated telephone system seems an unmanageable impediment. New foreign entrants will also focus on more lucrative and easier-to-serve centralized business clients.

Another immediate goal is the establishment of overlay digital backbones to provide international access for business and government, and to link major business centers. These networks are typically either microwave systems, or fiber optic networks, as are planned in Hungary and Poland. Given the difficulty of raising tariffs for the whole public-switched network, there are some important benefits from the fact that overlay and cellular networks can be tariffed at higher rates. Business customers are willing to pay these higher rates for better service until telecommunications operators reform national tariffing schemes for both land-based and cellular systems.[59]

Problems with *liberalization*

Some skepticism is justified with regard to telecommunications liberalization in this region. First, there is a question whether the rhetoric for telecommunications reform matches the genuine intentions of these governments and the ability or inclination of the system operators. While significant strides have been made quickly in upgrading the facilities and the services in primary cities, modernizing the entire networks is the real challenge,

57 Julian Bright, "Poland," *Telecommunications*, October 1991, p. 164.

58 OTA interview with Pal Horvath, op. cit., footnote 13.

59 Jürgen Müller, "Closing the Capacity and Technology Gap in Eastern European Telecommunications," European Regional Development Conference (EU-RDS), Prague, Nov. 19-23,1991, doc. no. EU-RDC-91/8-E (Geneva: International Telecommunication Union, 1991), p. 12.

If modernization is not integrally tied to changing corporate and social demand, this goal may not be met. Residential customers arc accustomed to paying artificially low prices for telephone service and may not be able to afford the higher rates for modernization.[60] Though initially successful, Bulgaria was unable to sustain a telecommunications modernization effort in the 1980s. Poland, too, has twice announced ambitious intentions to improve services, both of which fell far short of expectations. However, the financial participation from multilateral agencies and foreign investment from the West marks a major difference with previous reforms. There is strong interest among these countries, the European Community, and the United States in developing telecommunications networks rapidly.

Second, the pressure to liberalize telecommunications and open markets to foreign involvement creates an acute dilemma regarding procurement and manufacture of telecommunications equipment. The pressure to assure the economical construction of modern communications infrastructure, which in the short term will require purchasing Western products (or joint ventures with Western firms), conflicts with the need to solidify their own h igh-tech industrial bases.[61] Telecommunications equipment firms, 80 percent of whose production was until recently absorbed by the Soviet market, have been devastated by the breakdown of intra-bloc Comecon trade and the shift to hard currency transactions.[62] Efforts to keep these companies afloat will likely require some form of industrial policy as countries decide to what extent they will subsidize, privatize, or direct firms to engage in joint ventures with Western companies.

Third, resorting to advanced business services, overlay networks, and differential tariffs, while expedient for attracting foreign business, risks widening the gap between communication haves and have-nets. While there are some plans to improve rural and public pay phone services, investment and attention will go to those who can pay, leaving the public network to be modernized later.

Finally, the initial enthusiasm for wholesale reforms is beginning to subside. Plans to privatize telephone companies havc been delayed as the view reemerges that telephone service still should be entrusted to government. Problems with wholesale sectoral reforml in society in general are dampening plans for privatization and liberalization of the telecommunications sector. France has emphasized that its model of development may be more appropriate for CEE countries than that of the United States or the United Kingdom, since France managed to bring a

[60] To align the prices of service with the costs—not only of the delivery of the service but for modernization—will be difficult, as rate increases are likely to raise social tensions. This has happened elsewhere. Business Week reported that an Intended rate increase for telephone service in Venezuela had to be forestalled shortly after the military had mounted a coup attempt for fear of setting off more civil unrest. Mary Farquharson et al., "The Deals Are Good, But The Dial Tone Isn't," Business Week, No. 3260, Apr. 6, 1992, pp. 86-87,

[61] Jürgen Müller, op. cit., footnote 21.

[62] Marc Dandelot, "Telecommunications in Eastern Europe: Is the Problem Really a Lack of Money?" *Telecoms Magazine*, October 1991, pp. 41-46, cited in JPSR Report, Telecommunications, JPSR-TTP-92-001-L, Jan. 6, 1992, p. 14.

deteriorating telephone system up to a level of excellence without privatization, by means of thorough internal reorganization.

The process of transforming the centrally planned economy into a market economy in Poland, in particular, has been beset with problems.[63] Reports of fraud and scandal and troubles with effective tax collection are rife.[64] The telecommunications reforms have not so far delivered improvements in telephone service. The parliament has turned to a more cautionary plan of bolstering state industries and slowing down privatization.[65] Whether Poland's troubles will prove to be a foreshadowing of problems for the rest of Central and Eastern Europe or a guide to more successful transitions is yet to be seen.

Involvement of the United States

Western Europe, and particularly Germany. is deeply interested in economic and social reform in Central and Eastern Europe. In addition to being neighbors, Western and Eastern Europe share a similar heritage, and economic cooperation seems imminent. Nev - ertheless, the United States also has signifi - cant stakes in the future of the region. Beyond matters of national security, the opening of the CEE countries represents sizable new markets, and their success in the transformation to democratic governancc represents an affirmation of important economic and political ideals.

CEE countries also have an interest in participating in global markets, and are clearly looking to the United States for financial and technical assistance. For them, the United States presence represents a potential counterbalance to the influence of other Western European countries, principally but not exclusively Germany. The Overseas Private Investment Corporation and the Export-Import Bank encourage trade development by providing insurance and financing to U.S. exporters. U.S. participation in the World Bank, the International Monetary Fund, and the European Bank for Reconstruction and Development represents a major locus of financial assistance to Central and Eastern Europe.

Congress has acted to assist the economic and social transformation of the region; in 1989, Congress passed the Support for Eastern European Democracies Act (SEED), which allotted $1.5 billion in grants for 1990-92 to encourage political reforms, economic development, and social reforms (especially recognition of human rights) in Central and Eastern Europe. The SEED Act was an expanded version of President Bush proposal for $350 million in assistance to Poland and Hungar).

Congress has also been particularly interested in energy, environment. and telecommunications as the keys to these general market and political reforms in the CEE countries. The House Committee on Foreign

[63] For a very detailed account of Poland's experience with reform, see Lawrence Weschler, "Deficit," *The New Yorker,* May 11, 1992, pp. 41-77. See also Stephen Engelberg, "Poland's New Climate Yields Bumper Crop of Corrupt ion," *New York Times*, Nov. 12, 1991, p. Al.

[64] Whereas the state used to receive much revenue from the state industries, private companies are finding ways of avoiding paying taxes. "Poland's Wrong Turn," and "Poland Loses Heart, " *The Economist*, Feb. 22, 1992. Also, OTA interview with Martin Morell, Network Dynamics Associates, Washington, DC, Oct. 1, 1992.

[65] "Poland's Wrong Turn," and "Poland Loses Heart," *The Economist*, op. cit., footnote 64.

Affairs, for example, sent a delegation to Poland, Hungary, and Czechoslovakia in November 1990, which issued a report on "Eastern European Telecommunications, Broadcasting, and Environment. ' Congressional requests to the Office of Technology Assessment include policy information for Central and Eastern Europe on issues such as telecommunications and energy efficiency. OTA people have been involved in informal and formal discussions on developing science policy and technology assessment institutions in these countries.

The Office of International Communications in the Federal Communications Commission (FCC), along with the National Telecommunications and Information Administration, is working closely with several of the CEE countries to help establish regulatory mechanisms and spectrum management technique and expertise. Though significant constitutional differences make it difficult to exactly duplicate the U.S. FCC (an independent regulatory agency) elsewhere,[66] several countries have created telecommunications regulatory bodies with U.S. assistance, and others are in the process. The U.S. Telecommunications Training Institute, a private organization, works under contract to the U.S. Agency for International Development, and other private sector organizations work to bring management skills to Central and Eastern European telecommunications operators.

U.S. *involvement in reforming telecommunications in the region emphasizes advice, technical assistance, and private sector involvement, rather than direct aid.*

Despite these initiatives, some observers feel that the U.S. effort is meager relative to the magnitude of the problems CEE countries face. U.S. budget difficulties and economic conditions make it difficult politically to allocate much money to the region, and U.S. policy emphasizes advice and technical assistance rather than direct aid. This leaves a relatively greater role for U.S. private sector involvement in economic development in the region.

American companies have been active in telecommunications rehabilitation in the region, and in increasing numbers are capitalizing on the opportunity to tap into new markets, for both equipment manufacturers and service providers. Regional Bell operating companies (RBOCs) are involved in numbers of projects to build and/or operate cellular networks and data networks in key cities of the region (see chapter 4). U.S. West and Bell Atlantic joined the Czechoslovakian Ministry of Posts and Telecommunications to form Eurotel, a joint venture to build and run a cellular mobile system and construct a public packet-switched (data) network. Eurotel, of which each RBOC owns 24,5 percent, began operation in September 1991 with an initial capacity of 4,000 subscribers; the cellular system is expected to reach 50,000 within 5 years.[67] U.S. West is also involved in a venture to operate a cellular network with the Hungarian Telecommunications Company, Westel Radio-

[M] The FCC's "independence" is the carefully constructed result of t he tension between adm inistrat ive and executive (with the oversight of the judicial) branches of governance, which is unique to the United States. The Central and Eastern European countries are re-establishing parliamentary democracies, which characterize Western Europe.

[67] The regional Bell holding companies (R BHCs) expect to invest $60 million over 10 years in the system. "Telecommunications Profiles for Select Eastern European Countries," NTIA, Department of Commerce, Oct. 5, 1990. See also Charles Mason, "Czechs Turn Up Cellular Service," *Telephony*, Sept. 16, 1991, p. 3.

telefon, Kft. Westel went online in Budapest in October 1990 and attracted 4,000 subscribers in the first 6 months, surpassing the projected usc by 2,500 subscribers in the first year.[h]~

AT&T is pursuing contracts in Central and Eastern Europe and the republics of the former Soviet Union. It is installing a new international exchange in Warsaw for the Polish telephone company, which will double Poland's current capacity for international calls.[69] Additionally. AT&T is involved in a deal worth $26 million, signed in March 1992. to build a 1,400-km fiber-optic telephone network.

These deals require creative financing: AT&T is taking significant risks in getting paid, since all of the republics in the region have little if any hard currency reserves. and their currencies are not yet convertible. The company may end up with in-kind payments in oil or copper.[70] Businesses require clear rules and a stable political environment before they will undertake large-scale investment. Such stability is not yet present in many countries in the region. Wall Street is reluctant to commit much capital to ventures in the region, and has pressed for increased political risk insurance from the U.S. Government.

While the transformations underway in these countries create great opportunity, there are also pitfalls. Though much is known about capitalism, relatively little is known about the *transition* to capitalism, and Poland's experience with transition gives reason for caution. The challenges of transforming these societies are great, and the future of these countries' democratic and capitalist movements remains uncertain:

> *It is necessary to turn over the ownership of state-owned enterprises to private entities on some equitable bases. Obsolete, energy-wasteful, environmentally destructive plants must be replaced. Currencies have to become convertible. Transportation and communication infrastructures must be put into place. Entrepreneurial and managerial skills must be learned rapidly. Products capable of attracting hard currency must be manufactured. . . . In each of the countries, hundreds of laws need to be passed in order to transform the economy.*[71]

Retrenchment to authoritarian regimes is not unlikely if the reform measures do not shortly prove materially beneficial.[72] Reflecting the growing doubt about the benefits of democracy and a free market in Poland,

[68] U.S. West will contribute S20 million over the f irst 2 years to build t he system, while HTC, through World Bank loans, will invest another $20 m Ill Ion. OTA Interview with Andras Sugar, general manager, and John Handley, operat ions director, WESTEL (a U.S./Hungarian cellular telephone joint vent ure), and Jim Russell, manager of direct distribut ion, U.S. West NewVector Group, Budapest, Oct. 8, 1991. See also Steven Titch, "The Liberalization Express Roars Through Hungary," *Telephony*, June 3, 1991, p. 40.

[69] This deal is worth $12 m Ill Ion. "AT&T Signs Polish Accord," *Telcom Highlights International, vol. 14, No.* 16, Apr. 15, 1992, p. 1.

70 John Keller, "AT&T Signs Big Contract to Supply Former Soviet Republic With Phone Gear," *Wall Street Journal*, Mar. 3, 1992, p. A2.

7.Madeleine Albright, "The Role of the United States in Central Europe," Proceedings of the Academy of Political Science, Nils H. Wessell (cd.), New York, 1991, vol. 38, No. 1, p. 80.

72 Ibid.

It is in the political interest of the United States to promote telecommunications, in order to solidify democratic gains in Central and Eastern Europe.

President Lech Walesa has claimed that foreign companies are reaping the benefits of Poland's privatization without contributing anything to the culture, economics, or infrastructure of the country.[73] There is growing frustration in Poland over a perceivcd lack of involvement and investment by the United States in Poland's modernization. The division of Czechoslovakia into the Czech Republic and Slovakia signals not only abiding nationalist sentiments, but also differences over industrial development strategies, including reliance on market mechanisms in economic development.

The relation between economic activity and telecommunications is well known, though not always well understood. It is no coincidence that the conditions of telecommunications networks in these countries deteriorated (or failed to develop) alongside ruinous economic policy; and it will be no coincidence if these networks improve hand-in-hand with economic reforms. However, to suggest that telecommunications directly *leads* to economic development is to overstate its place in a far more intricate social/political/economic/cultural dynamic; indeed. the quality of the communications network may be as much a consequence as a cause of a strong economy. Modem telecommunications may be necessary but is not sufficient for development of a modern industrial and service economy.

Conclusion

The countries of Central and Eastern Europe are in need of quick repair to their telecommunications networks; they are also in need of quick repair to other critical infrastructure and institutions. In the telecommunications sector, the United States is pressing for an aggressive "liberalization" agenda. This entails primarily the divestiture of the telephone operator from the government and its eventual privatization, open entry and free-market competition for services and equipment. This approach, paced by strong industry input, is based on self-interest as well as a commitment to improve welfare in the CEE. The opportunity for U.S. equipment and service suppliers to receive contracts is greatly improved by a competitive free-market environment, where Western products are generally superior to indigenously-produced equipment, at least for the time being. A competitive free-market environment depends on the existence of an independent oversight body and the replacement of political criteria by economic and operational factors. There may also be benefits associated with roughly similar regulatory approaches among nations as well.

Finally, the United States is motivated in part by a sense of democratic purpose. It is in the U.S. Government's political interest to promote broader and deeper access and use of telecommunications in order to solidify democratic gains in the region, which would hedge against a return to antidemocratic regimes in the future.

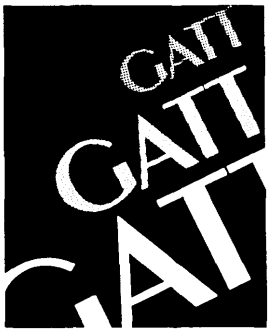
The fuller implications of liberalization and competition, or even privatization, seem to be often overlooked for short-term considerations. What is good for U.S. firms is presumed to be good for these countries. While a number of agreements have already been struck by U.S. firms to provide investment, products, or services, CEE policy makers

73 Blaine Hard in, "Poles Sour on Capitalism: Walesa Accuses West of Preying on Country," Washington *Post*, Feb. 5, 1992, p. Al.

are somewhat ambivalent about the appropriateness of U.S. recommendations for their needs and circumstances. They have not rushed to embrace the U.S. regulatory model, and have considered more statist models, such as European telecommunications, particularly France, as possibly more appropriate to their needs. They also undoubtedly have hesitated because of their own inexperience, uncertainty, and lack of consensus about what direction they should take. The challenge facing the United States generally is how to encourage CEE countries to adopt particular types of reforms that most further U.S. interest in an area where U.S. leverage is generally weak. The EC member countries are also attempting to persuade CEE countries to reform in particular ways, not all of which are exactly as U.S. interests would wish. Thus North America and Western Europe are struggling over Central and Eastern Europe, trying to influence structures and regulations and ultimately gain access to new markets.

Domestic Deregulation and International Trade Negotiations

CHAPTER 7



Telecommunications deregulation in the United States has led to pressure for new international trading arrangements.

THOUGH SERVICES SUCH AS TELECOMMUNICATIONS W-C increasingly central to the operation of the global economy, rules governing international trade in services arc still being established. This chapter describes the process that is generating these rules, and examines the principal forum in which they have been debated, the General Agreement on Trade in Services, a component of the General Agreement on Tariffs and Trade (GATT). U.S. policy and negotiating positions for GATT talks arc then discussed, because these have become major determinants of U.S. international telecommunications policy.

U.S. deregulation and the worldwide consequences

Before the 1980s, the concepts of natural monopoly and universal service dominated telecommunictions. Telephone systems were conceived as intricate technical systems presided over by engineers and regulators whose main responsibility was to ensure the smooth operation of networks. Since telecommunications operators were national monopolies and each monopoly dealt directly with its foreign counterparts, there was no need for an international trading system. Public telephone operators (PTOs) struck political bargains that set stable patterns of relationships for many years. The International Teecommunication Union (ITU) coordinated the relationships of these national bodies. The ITU consultation process developcd technical standards to permit interconnection, and the international settlements process assured that accounts between countries would be reconciled.

With countries (through their national telephone operators) negotiating prices and terms of service with one another under the ITU, more generally applicable rules for trade were thought to be unnecessary. Because international telecommunications were provided by monopolies over circuits that the monopolies each half-owned, services were considered the result of joint investment, and not traded items.

In the late 1970s, telecommunications deregulation in the United States began to change these assumptions. Pressure for new international telecommunications trading arrangements mounted in the United States. as a result of deregulation, technological change, the entry of new suppliers, and the beginnings of political organization of telecommunications users.

Telecommunications competition in the United States began with microwave technology, which made long-distance competition possible in the 1970s, and with digitization of data, which blurred the distinction between computing and telecommunications. With the divestiturc of AT&T in 1984, the Modified Final Judgment (MFJ) laid down by a U.S. District Court became a key aspect of U.S. teleccommunications policy. Telecommunications costs and terms of use became a prime factor in profitability and competitiveness for many large businesses.

Large corporate users of telecommnunications began to form active interest groups. The largest users arc concentrated in a small number of firms: it is widely believed that 20 percent of users generate 80 percent of revenues, and less than 5 percent of users generate 20 percent of local traffic and over 50 percent of long-distance traffic. This concentration made it easy for large users to organize. They began to pressure political decisionmakers to allow them to intercon-

Competition in ***the United States challenged the monopoly service*** *providers in other countries, who have come under fire from international users and from domestic users as well.*

nect their offices independently of the telephone company.

The development of microelectronics brought new suppliers into the telecommunications equipment market. Computer equipment firms such as IBM and Control Data now wanted telephone monopolies opened up so that they could compete in the equipment markets. Some firms such as Electronic Data Services (EDS) and IBM saw new opportunities to offer information services, but needed access to the national network to do so. New network operators, first MCI and later Sprint, wanted to compete with AT&T for long-distance traffic.

Deregulation resulted in opening the U.S. telecommunications equipment market to foreign as well as American firms. This had immediate and significant trade consequences. The U.S. balance of trade in telecommunications equipment went from a surplus of $275 million in 1982 to a deficit of $2.6 billion 6 years later, due largely to the lack of reciprocal overseas markets for customer premises equipment (handsets and other terminal equipment). [1]

With U.S. deregulation, the government monopoly mode] of Postal, Telephone, and Telegraph (PTTs) administrations began to come under strain. Competition in one country presented problems for other countries. It raised questions about systems organization and operation, especially flows of funds between countries to settle international telephone financial accounts, How were national monopoly telephone operators to negotiate with several competing telecommunications firms in one country? How was "plain old telephone service" (soon known as POTS) to be distinguished from newer value-added services? Where competition was allowed, what conditions would be imposed on foreign competitors, especially those from countries where competition was not permitted? Who would be allowed to own what kinds of facilities or radio frequencies? How could competing service providers deliver enhanced and value-added services without having their own facilities? How could countries maintain distinctions between basic voice telephony and enhanced services (and so preserve the 1 ion's share of business for the monopoly provider), when technological change, such as digitization of voice signals, rendered them meaningless?[2]

The basic business practices and profitability of most foreign PTTs, as well as those of AT&T and its operating companies in the United States, were directly challenged by competition. Their stable organizational environment came under fire, along with their elaborate systems of cross-subsidies, which had been set up to achieve a variety of economic, social, and political goals, such as universal service,

In many countries, long-distance and international telephone services subsidized local telephone service, business telephone service subsidized residential telephone service, and urban telephone service subsidized rural telephone service. In some countries also, revenues from telecommunications

[1] Kenneth Robinson et al., "International Telecommunications Trade," *After the Breakup: Assessing the New Post-AT& T Divestiture Era,* Barry G. Cole (cd.) (New York, NY: Columbia University Press, 1991), pp. 428-445.

[2] Karl-Heinz Neumann, "Models of Service Competition in Telecommunications," *Restructuring and Managing the Telecommunications Sector,* Bjorn Wellenius et al. (eds.) (Washington, DC: The World Bank, 1989), pp. 19-21.

contribute to both the general treasury and the postal services These cross-subsidies would be difficult to sustain in a more competitive world, where companies are forced to reduce prices and costs. Furthermore, strong PIT telecommunications unions resist the inevitable change in employment levels and practices that result from deregulation and the attendant cost-cutting.

PTTs, which in the remainder of this chapter will be called public telephone operators (PTOs), arc also concerned about eroding market share and their perceived inability to finance network modernization unless they control the new high-value enhanced information and data services—the most profitable business traffic and also that traffic most likely to migrate to the competition. On the other hand, lower telecommunications prices mean lower costs for both business and residential consumers, and may ultimately result in increased revenues for the telephone operator due to greater calling volume.[4] Finally, PTOs worry that the presence of competitors will seriously undermine their control over their own operations.[5]

Liberalization of telecommunications occurred first in those countries where the political mobilization of business interests was greatest: the United States, the United Kingdom, and Japan. As one analyst has observed:

> *While winning the regulator-y battle at home, [U. S.] firms calculated that the U.S. bargaining power made global reform feasible, and they became the most prominent exponents of regulatory reform in many countries. But in the 1980s, a translational corporate coalition .for reform emerged as firms in other countries wanted to match the terms offered to U.S. companies.*[6]

Thus change in the United States brought about change in other countries. Large users in the EC saw that to be competitive with U.S. and Japanese firms, they needed to reduce their costs, increase their scale, and improve their ability to deliver flexible and timely services.[7] The Commission of the European Community acted to open parts of the European market to reduce telecommunications costs and thereby improve operating efficiency for all firms. To do this, users required (but did not immediately get) more favorable operating terms from PTOs.

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[3] Timothy E. Nulty, "Emerging Issues in World Telecommunicate ens," in Bjorn Wellinius et al. (eds.) op. cit., footnote 2, pp. 17-18.

[4] This has been the experience in Europe, Latin America, and Asia.

[5] European PTOs have been working over the past decade to strengthen their control of the evolution of both technology and the policies that shape it. In general, European PTOs are politically more powerful than their countries' computer and electronics industries, whereas in the United States the reverse tends to be the case. For example, the stronger role of PTOs is reflected in the scarcity of corporate private networks and the widespread use of X.25 protocols in Europe for data networks, while in the United States computer equipment companies have successfully pushed U.S. data networks toward other protocols as well as X.25.

[6] Peter F. Cowhey, "The International Telecommunications Regime: The Political Roots of Regimes for High Technology," *International Organization,* vol. 44, No. 2, spring, 1990, p. 188.

[7] See Giandomenico Majone, "Cross-National Sources of Regulatory Policymaking in Europe and the United States," *Journal of Public Policy,* vol. 11, No. 1, pp. 79-106.

Changing attitudes toward services and trade

The globalization of business pushes firms to seek telecommunications operations that can help them deliver similar services worldwide, and this may mean bypassing national networks or locating operations elsewhere. The country with the environment most conducive to telecommunications for business sets the standard for all others.[8]

As major users tried to modernize their networks, they sought more flexible terms of access and prices and the right to attach new equipment. Foreign telephone operators were unwilling to provide these terms, arguing that such changes would require new investment or new operating procedures. In reality, these restrictions protected foreign markets from inroads by U.S. or other foreign firms.

Meanwhile, U.S. telecommunications equipment manufacturers, in particular AT&T, were alarmed by their eroding share of the equipment market (as noted above). While the portion of the market initially most affected was consumer premises equipment (e.g., telephone handsets), U.S. switching equipment manufacturers saw their market share threatened over the long run.[9] It is widely believed that there is significant world overcapacity in manufacturing of central office equipment, as the cost of designing, developing and producing it rises precipitously.

U.S. equipment manufacturers believe the way to gain access to European telecommunications equipment markets is to break the link between PTOs and their national preferred monopoly suppliers. One way would be to liberalize services markets, which would engender competing service providers, and, in turn, result in more competitive equipment markets, since each national competitor would try to develop its own sources of supplies.

In essence, U.S. users want access to foreign markets on nondiscriminatory terms. But large users in the United States cannot achieve their objectives without outside allies, as changes in foreign regulatory regimes will be necessary. Foreign users want terms and service similar to their U.S. counterparts to protect their competitive advantages. Under serious pressure from the EC Commission, beginning notably with its 1987 Green Paper on telecommunications services, PTOs now realize that they must respond to their large users to keep control of their own domestic telecommunications systems. They have begun, reluctantly, to reduce cross-subsidies to small users in order to relax barriers to terminal equipment trade.

The United States, the United Kingdom, Japan, Australia, Canada and Sweden have now introduced some forms of competition in basic services and in network facilities

[8] Jonathon David Aronson and Peter F. Cowhey, When Countries Talk: *International Trade in Telecommunications Services* (Cambridge, MA: Ballinger Publishing Company, 1988), p. 33.

[9] AT&T claimed that Siemens, the German telecommunications equipment giant, was sell ing its equipment in the United States for less than a quarter of what the Deutsche Bundespost Telekom, the German telephone operator, was paying, in essence dumping telecommunications switching equipment in the United States and cutting into AT&T's markets. AT&T declines to pursue Siemens in trade courts at the current time. OTA interview with International Trade Administration official, Dec. 4, 1992.

(i.e., facilities-based competition).l" Shifting the international telecommunications regime toward competition has been difficult because the traditional monopoly regime in most countries is supported by institutional and governmental interests. PTOs arc usually powerful government ministries that often contribute substantial funds to their general treasuries. Many PTOs assume that they would fail to compete effectively with U.S. firms that have had nearly a decade of experience in a competitive marketplace. There is usually resistance from a PTO labor force, which in many European countries is organized and extremely powerful. Some countries also see their PTO as important to the maintenance of national sovereignty.[11] Altering the telecommunications regime significantly will thus require sustained political dedication and effort. Many EC governments are resisting the efforts of the EC Commission to liberalize telecommunications.

Moving toward GATT

As the consensus on telecommunications as a natural monopoly began to crode in the 1970s, the lack of rules covering trade in services could be seen as blocking the expansion of free trade. U.S. banking, telecommunications, data processing, and other service firms saw that new technologies put within their reach lucrative markets that they could not go into under the existing trade regime. Thus, a small number of firms, led by the American International Group (an insurance company), American Express, Citicorp, Merrill Lynch, and Sea-Land (a shipping firm), began to press for services to be included in GATT Congress acceded to this pressure: with the passage of the Trade Act of 1974, Congress for the first time asserted that services were to be included in the definition of international trade, and directed the Administration to work toward an expansion of GATT to include trade in services.

The United States was unable to make much headway in the Tokyo Round of GATT in the 1970s, but this failure led to efforts by the United States to take the issue up in the Organization for Economic Cooperation and Development (OECD), where it was believed that a more analytic approach to developing the conceptual framework might be possible. The members of OECD were persuaded to begin a study of service trade issues. Trade-oriented service firms succeeded in persuading Congress to give services equal footing with merchandise trade in the 1979 Trade Agreements Act, which then led to the 1984 Trade and Tariff Act specifying that the President should give high priority to the negotiation of multilateral and bilateral agreements governing services trade. [12] By 1982, U.S. efforts came to fruition in the form of an agreement in GATT

Shifting the international telecommunications regime toward competition has been difficult as poweful interests in many countries resist.

[10] The first three countries have been on the forefront of regulatory change. The United States, the United Kingdom, and Japancomprise about 60 percent of the world telecommunicateons market. They are also t he largest and most important international financial centers, and have many multinational manufacturing enterprises that demand leading edge communications and computing technologies.

[11] Recent rejection of telecommunications privatization in Venezuela, and continuing difficulties in the privatization of telecommunications authorities in some countries in Eastern and Central Europe attest to the significance nations continue to attach to their own telecommunications systems.

[12] Jonathon David Aronson and Peter F. Cowhey, op. cit., footnote 8, p. 37.

that countries that wished could undertake national studies of trade in services.[13]

Political support for including services in an international trading regime based on GATT grew in the mid- 1980s when increasing U.S. trade deficits prompted American free trade supporters, concerned with what they saw as increasing protectionism, to seek new allies to protect free trade. In the 1988 Trade Act, Congress explicitly included telecommunications trade as a priority for U.S. trade negotiations, and specified a set of general and specific objectives that the United States Trade Representative (USTR) was to seek in opening foreign markets to U.S. suppliers of both equipment and services.[14] If U.S. services firms could gain access to foreign markets more readily, then U.S. equipment sales would improve as well. Also, if PTO monopolies were forced open, U.S. equipment firms would stand to gain from sales to the new competitors. The coming together of these interests led to real innovation in trade policy.

As the consensus that telecommunications is a natural monopoly began to erode, the lack of rules covering trade in services became an impediment to free trade.

In the U.S. Government, conceptual work began in the mid-1980s to clarify the notion of trade in services, hitherto not recognized as a legitimate subject of multilateral negotiation. In economic theory, services were generally not thought of as tradeable items; therefore measurement of such services that were traded was practically nonexistent. With no conceptual framework or data, governments typically believed that services trade was insignificant, and therefore unnecessary to include in multilateral negotiations. Lacking both adequate measures of trade and conceptual frameworks on which to hang policy, support for services exports was almost nonexistent. For example, financing of goods trade is well understood, and there are a variety of Federal programs to promote goods trade abroad, but services do not receive financing proportionate to their significance in overall U.S. exports.[15]

In the case of telecommunications services, the negotiation of the U.S.-Israel and U.S.-Canada Free Trade Agreements in the

13 The events leading to GATT signatories agreement to consider discussing trade in services is a complex story. See Geza Feketekuty, *International Trade in Services: An Overview and Blueprint for Negotiations* (Cambridge, MA: American Enterprise Institute and Ballinger Books, 1988); and Bela Balassa, "The United States," Patrick A. Messerlin, Karl P. Sauvant, et al., *The Uruguay Round: Services in the World Economy* (Washington, DC, and New York, NY: The World Bank and the United Nations Centre on Transnational Corporations, 1990), p. 129. For a dissenting view of the desirability y of the United States' efforts to continue to support GATT, see Clyde V. Prestowitz, Jr., Alan Tonelson, and Robert W. Jerome, "The Last Gasp of GATTism," *Harvard Business Review,* March/April 1991, pp. 130-138.

14 While both equipment and services are the subject of t he 1988 Trade Act, t he shift in the U.S. balance of trade in telecommunications equipment from a surplus of $275 million to a deficit of $2.6 billion provided much of the impetus for the legislation. The breakup of AT&T had led to the unilateral opening of the U.S. market in telecommunications equipment without any attempt to extract reciprocal concessions from U.S. trading partners. See Kenneth G. Robinson et al., op. cit., footnote 1, p. 431, passim. Throughout this chapter, Robinson and the other contributors make virtually no reference to telecommunicate ions services.

15 OTA interview with Robert Atkins, International Trade Administration, Department of Commerce, Oct. 1, 1992.

1980s laid much of the intellectual groundwork.[16] The concepts of trading telecommunications services and their coverage by GATT principles are now widely embraced, but less than 10 years ago, they were thought to be radical innovations.

In general, the United States led the way to relaxation of restrictions on international telecommunications during the 1980s. For example, there was growing interest in the idea of deploying telecommunications satellites outside the monopoly international telecommunications satellite consortium, Intelsat. Under U.S. pressure, INTELSAT liberalized its process for approving competitive satellite systems and, and in return, the United States has refrained from attacking Intelsat's exclusive carriage of international public switched international telephone traffic. INMARSAT, the international maritime satellite communications organization, has begun to explore new business opportunities considered beyond its purview a decade ago, such as aeronautical and Iand-mobile personal communications services.

Choosing a forum

The choice of GATT as the arena for changing international trade relationships with regard to telecommunications was made carefully. The European PTOs' resistance to change had been buttressed by the fact that there was only one international forum for discussion of telecommunications issues, the International Telecommunication Union (ITU). The ITU has always been the province of national telecommunications authorities and, therefore, has never been sympathetic to competition. Although the ITU has little real power in the enforcement of international agreements, it is important in creating frameworks in which rules and regulations operate.

OECD has also played an important role in issues such as privacy, accounting rates, and financial and capital flows, but it is considered to reflect the interests only of the richest countries. The United Nations Conference on Trade and Development (UNCTAD) has long played a role in coordinating international shipping and insurance services, and could well have assumed some jurisdiction over telecommunications. This was rebuffed by the industrialized nations, because of the weakness of UNCTAD's dispute-resolution mechanisms.

GATT was ultimately chosen by the United States as the venue for pressing for changes in the international telecommunica - tions regime, in part due to the perception that only GATT has a dispute-resolution mechanism with teeth for enforcement. The choice of GATT meant that services, and telecommunications services in particular, had to be cast into terms that the traditional trade community would accept; their tradability had to be established. Given the institutional opposition to change in both the ITU, which would lose some control of international telecommunicate ions, and

[16] For a clear and complete discussion of the U.S.-Israel Free Trade Area Agreement, and the role it played in helping U.S. trade negotiators to formulate basic principles on trade in services, see Carol Balassa, "Negotiation of Services in the U.S.-Israel Free Trade Area," unpublished manuscript. For a general treatment oft he t rade in services concept formation, see Geza Feketukut y, *International Trade in Services* (Washington, DC: American Enterprise Institute, 1986). Much of the early work on trade in services was driven by user Issues, and was fully supported byUSTR. The agency played an im port ant role inelaborat ing these ideas.

within GATT, which had seen its mission solely in terms of trade in goods, the United States found it necessary to attempt to effect changes on two fronts. In these efforts the United States was joined by the United Kingdom and later by several other countries.

Building an international constituency

An important series of negotiations affecting telecommunications services trade occurred at the ITU World Administrative Telegraph and Telephone Conference (WATTC) in 1988 in Melbourne, Australia.[17] This conference established a new set of International Telecommunication Regulations, which on July 1, 1990, superseded those written 25 years before. The main issue in Melbourne was how ITU members, no longer all public telephone operator monopolies, would deal with the questions of deregulation, privatization and competition. Many countries feat-cd the United States would induce the ITU to accept regulations that would force competition, which would run against their own national policies and might infringe on national sovereignty.

Against significant opposition, the United States has constructed an intellectual framework and a political foundation for more liberal trade in services.

At the root of U.S. concerns in Melbourne was an interest in facilitating the deployment of specialized, private intracorporate networks. ITU regulations have the force of international law, and the ITU Consultative Committee on International Telegraph and Telephone (CCITT) regulations, though voluntary, are widely adopted by member countries. The United States wanted to make sure that these regulations did not provide countries with a means to prohibit private networks or competitive service offerings. A compromise position was adopted (Article 9), stating that countries wishing to permit special arrangements for value-added services or private networks could do so.] [8]

Large telecommunications users in the United States saw the results of WATTC as crucial to their ability to conduct their business internationally and, to underline the importance of these results, there is now some concern that the subsequent GATT trade in service negotiations may actually reduce firms' scope of activity. Other U.S. service industries, such as construction, maritime shipping, and air transport, were less enthusiastic about submitting services to a GATT regime. The U.S. construction industry, for example, wants help competing with foreign firms that have access to government financing for overseas business, and resists opening the U.S. market to such foreign firms. Maritime shipping and air transportation have separate trade agreements that set their trade rules, and these industries tend to see open markets as disruptive.

The United States also had to convince other countries to allow services to be put on the agenda. Many countries wanted to con-

17 G. Russell Pipe, "Telecommunications Services: Considerations for Developing Countries in Uruguay Round Negotiations," United Nations Conference on Trade and Development, *Trade in Services: Sectoral Issues (New* York, NY: United Nations, 1989), pp. 74-78.

[18] The subsequent CCITT D.1 recommendations provide all the details on private line services. U.S. trade officials attended these meetings and watched closely to see that t he resulting regulations or resolutions did not commit the United States to positions that would violate the 1988 Trade Act.

[19] OTA interview with Phi l ip Onst adt, sen ior manager of internaional telecommunicate ions regulatory affairs for the International Communications Association, a U.S. industrassociation of international telecommunications users, Nov. 12, 1992.

tinue to trade with the United States on a preferential basis, and would go along with the United States only to an extent.

While Canada, the United Kingdom, Sweden. and Japan were the earliest supporters of the U.S. position on services, some European countries were more reluctant to follow the U.S. lead. France wanted more assurances but later become a vigorous supporter of a GATT services agreement. Germany was concerned about the future position of the Bundespost, the largest German employer, under a new services trade regime. The EC has jurisdiction in Europe on trade, but not on services; however, the EC came to support the general idea of trade in service negotiations by March 1985.

Once the United States had secured EC support for service negotiations, other developing countries had to be persuaded not to oppose the idea. Opening GATT to services was viewed with suspicion by developing countries, who saw the dominance of the United States and other advanced nations in high-tech services as a threat. Brazil and India led the developing countries in opposing services in GATT. However, free trade gradually came to be seen as potentially compatible with economic development objectives. Due to lower unit labor costs, developing countries may have advantages in some subsectors of services.[20] Increased service trade also can benefit developing countries because cheaper inputs, such as telecommunications, can make other economic activities more competitive. The Unitcd States was willing to make political concessions to developing countries on interest rates and debt arrangements, and threatened that it would turn to bilateral service trade agreements (which would benefit only those who participated) unless GATT was used as a forum. In September 1986, the United States won its struggle to get services trade on the agenda.

GATT

GATT is a wide-ranging agreement, covering many countries. For most of its history, GATT dealt with trade in commodities and merchandise. When it was established in 1948, the most fundamental elements of world trade were steel. coal, and manufactured goods. Services were thought to comprise an insignificant proportion of world trade.

The United States argued that established GATT principles of market access, fair competition, and resolution of trade disputes should apply to services, including telecommunications. Because trade in services is more difficult to measure than trade in goods, and barriers to trade arc likewise difficult to define, GATT would be a valuable forum for resolving grievances over market access. This principle is of fundamental importance to U.S. negotiators and to U.S. companies.

GATT rules arc designed to be applied across al I commodities and signatories.[21] This general principle gave rise to a serious dispute over the U.S. position that services could be part of a GATT framework: some

20 Patrick A. Messerlin and Karl P. Sauvant, "Introduction," in Patrick A. Messerlin, Karl P. Sauvant, et al., op. cit., footnote 13, p. 2.

21 GATT discipline does not fully apply to certain sectors, such as agriculture and textiles. Richard H. Snape, "Principles in Trade in Services," Patrick A. Messerlin, Karl P. Sauvant, et al., op. cit., footnote 13, p. 7. See also G. Russell Pipe, "Telecommunicate ens," in the same volume.

argued that since services are so varied in their characteristics, it was not practical to negotiate a single set of trade rules for them. Others argued that a general framework would be more likely to lead to liberalization than would an approach dealing only with individual sectors. General principles are at the heart of GATT' rules on trade, and the effort in the services negotiations has been to find ways to apply these rules, derived from trade in goods, to service sectors.[22]

This argument was resolved with a compromise that general principles would be agreed on through a separate parallel negotiation on services, to take place alongside the negotiations on trade in goods. This would keep the services agreement from becoming too quickly incorporated into GATT without giving countries an opportunity to mitigate its effect on various sectors of their economies.[23] Second, there were to be sector-specific negotiations, codified in annexes, including one for telecommunications. This compromise permitted concerns for general principles and maximum flexibility both to be satisfied. Finally, it was agreed that the rights enumerated in the annex would come into force only if there was agreement on terms of access to markets in specific sectors, such as telecommunications services.

Most disagreements among GATT signatories stem from governments' efforts to protect their domestic industries while attempting to gain access to sectors of others' markets. The concepts outlined below were agreed on in principle at the 1989 Uruguay Round Mid-term Review in Montreal. It was also agreed that the negotiations should next turn to the application of these general principles to specific sectors. This has been underway since 1990.

General principles

NONDISCRIMINATION. Nondiscrimination is a core principle of GATT. It asserts that any advantage extended to one signatory must be applied to all signatories, and that withdrawal of trading privileges for one country must mean withdrawal for all. This is the most-favored-nation (MFN) principle. Applying it to international telecommunications services conceivably could require important changes to the way in which services arrangements are set up, since these arrangements (i.e., accounting rates) are negotiated bilaterally. Existing arrangements would, however, likely be accepted as preexisting commitments.

MFN could permit free-riding by some signatories, who could take advantage of other countries having already reducing sectoral trade barriers. Country A may not have a reason to drop its telecommunications trade barriers with the United States if the United States has already dropped its own. Efforts have been made in successive GATT rounds to reduce this problem by negotiating concessions on specific products, as has occurred with respect to telecommunications procurement. This aspect of GATT has, however, become less important as countries increasingly negotiate bilateral concessions rather than multilateral ones.[24]

22 Richard H. Snape, op. cit., footnote 21, pp. 5-7.

23 Stefan Voigt, "Traded Services in the GATT—What's All the Fuss About?" *Intereconomics, vol.* 26, No. 4, July/August 1991, p. 177.

24 Richard H. Snape, op. cit., footnote 21, p. 8.

NATIONAL TREATMENT. National treatment differs from MFN in that it requires that there be no less favorable treatment of foreign firms than of national firms. Restrictions may be imposed, but must apply to all firms equally, foreign or national. It does not imp] y a requirement to permit unconditional access to a market. Where no competition by domestic firms is allowed for a national monopoly, there will also be no competition by foreign firms.

MARKET ACCESS. Market access is one of the most important principles of GATT. It denotes the extent to which service providers wishing to offer a service in a foreign market can enter without confronting entry barriers or other requirements. The 1988 Montreal declaration states that firms may supply their services by whatever means they prefer, and especially identified the telecommunications sector as covered. For telecommunications services. market access includes:

- the right to lease lines for data transmission within and between countries:
- reasonable prices for services;
- freedom of choice in the types of equipment to attach to the network;
- reasonable flexibility in interconnection standards; and
- the right to store and process information.

LIBERALIZATION. Liberalization is often grouped with *transparency* and *predictability* as principles of GATT Liberalization is the general promotion of trade across borders, especially by means of increased market access and international competition, but with allowance for national policy objectives. Transparency is the public availability of the rules and regulations, including tariff schedules, that govern services in any country in order to limit the possibility of petty or covert bureaucratic or political limitations to legitimate trade. Predictability of trade rules follows from the consistent application of these principles.

SAFEGUARDS AND EXCEPTIONS. Safeguards and exceptions from international rules must be allowed if political agreement is to be achieved, since countries will generally not agree to bind themselves to inflexible principles. Safeguards and exceptions are permitted under GATT rules, and are very important in the telecommunications sector. National sovereignty has long been a concern of nations with respect to their telecommunications networks, and social, and political objectives are often sought through the use of telecommunications networks and pricing structures. Safeguards and exceptions allow countries with such concerns to reserve access to parts of their markets. Nations retain the right to regulate to achieve national policy objectives, with the proviso that such regulations are consistent with the liberalization commitments under the framework.

Non-discrimination and national treatment are important GATT principles; their application to telecommunications services must be negotiated.

These general principles have been the basis for negotiations since they were agreed to in 1989. However, their actual formal acceptance is not a foregone conclusion. Some arc especially troublesome as applied to services.

Trade economists, until recently, generally believed that services were only consumable at the point where they are produced, and thus arc limited to domestic markets. To the extent that such services were provided by foreign firms, it was thought that these firms generally are required to invest in or rent local facilities. With the market access principle, GATT could for the first time play a role in limiting

Box 7-A. TELECOMMUNICATIONA ANDNATIONAL SOVEREIGNTY

National sovereignty has been a critical issue in control of telecommunications networks since their origins in the early 19th century.[1] Nations have typically held that national control (either directly by the government or by government-sanctioned monopolies) was vital for economic independence and national security (control of communications for military purposes). In the late 1970s, the U.S. Department of Defense argued in court that AT&T ought not to be divested of its local operating companies on the grounds that this would harm national military communications systems.

With the erosion of monopoly telecommunications regimes **and the movement toward competition, pressure has mounted against maintaining national control in the name of security or sovereignty.** The military constructs and operates its own networks where it is concerned about control-this is as true in the United States as it was in the Soviet Union, which had several networks for military and Communist Part y use. Competition, particularly when it involves separate facilities, may provide increased security through having multiple suppliers of comparable service, and hence redundancy, which is one key to survivability.[2] Governments also have a variety of regulatory tools, including the right of expropriation or nationalization during wartime, to control the activities of telecommunications firms, whether domestic or foreign-owned.

However, national sovereignty is still a significant concern. Israel has recently rejected a bid to privatize its network, for fear of compromising national security and sovereign y, and many developing countries are also unwilling to do so. Many countries fear the effects of "propaganda" transmitted to their citizens by external enemies. Others fear a dilution of their distinctive cultures. Many experts warn that the huge volume of funds electronically transmitted around the globe daily seriously decrease the control a country can exert over its currency and its ability to implement national monetary policy.[3]

1 Manley R. Irwin, "National Sovereignty and Global Networks," OTA Contractor report, July 1992.

2 However, if competitioncauses companies to operatetoo close to safety marginsin order to cut costs, or toscrimp on capital investment, it may engender lower reliability.

3 U.S. Congress, Office of Technology Assessment, *U.S. Banks and International Telecommunications*, OTA-BP-TCT-100 (Washington, DC: U.S. Government Printing Office, September 1992).

SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

national restrictions on foreign investment.[25] Market access, apart from direct imports, also deals with the right of foreigners to establish businesses in a signatory country. This means permission to setup telecommunications networks to deliver services and the right to make investments in such networks (''the right of establishment' '). Since service delivery often involves a specialized or private network, firms need to be able to create and operate corporate networks with minimum hindrance. Services firms also want ''the right of nonestablishment," the right to operate without having to set up a subsidiary or other local presence if services can be delivered directly. Essentially, firms want to structure their operations according

25 Peter F. Cowhey, op. cit., footnote 6, p. 194.

to the requirements of the services to be provided.

Network design is important in delivering services, and therefore standards-setting is part of market access. This implies that national networks should have diverse representation in their standards-setting processes. including input by users as well as carriers and equipment providers. Currently, the ITU standards process gives great latitude for national or regional variation in standards, allowing some nations to close their markets behind a wall of national standards. Foreign services providers and equipment companies want to play a more direct role in standards-setting to prevent this. This notion of vesting large users with what amount to minimum rights through GATT is a new concept.[zh]

Market access would also require more GATT oversight of signatory policies on telecommunications service pricing, customer service levels, and procedures for redress of grievances in disputes between users and telecommunications operating authorities. Treating these as trade issues would benefit large foreign users who depend on local telephone companies to make the final connection to customers.

The Telecommunications Annex

A GATT Telecommunications Annex was informally agreed to by GATT member states in spite of the stalled GATT general negotiations. Negotiators say that the principles embodied in this annex were partly worked out in the course of negotiations of the U.S.-Israel and U.S.-Canada Free Trade Agreements, and latcr some of the essential elements of this annex were adopted in the North American Free Trade Agreement (NAFTA).[27]

The current telecommunications annex to the General Agreement on Trade in Services has been called the Telecommunications Users' Bill of Rights, because it lays out for the first time explicit rights of users. The basic outlines of the annex provisions are:

- Transparency must be ensured, including information on tariffs and conditions of service, specifications of technical interfaces, information on standards organizations, information on conditions of attaching terminal equipment, and licensing or recgistration information.
- Network access must be assured on reasonable and nondiscriminatory terms, and pricing of public telecommunications must be cost-oriented. Leased lines will be available to signatories, and users must be

Service providers and equipment manufacturers are demanding a direct role in standards-setting so that markets won't be closed to them through technical Incompatibility.

[26] Peter F. Cowhey, "The Future of the Telecommunications Market place," *The Telecommunications Revolution: Past, Present, and future,* Harvey M. Sapolsky, et. al. (eds.) (London and New York: Routledge, 1992), p. 153,

27 This report does not deal with international telecommunications in other areas than Europe. However, it must be noted that some observers sharply disagree that NAFTA telecommunications provisions are essent I ally t he same as t hosen GATT. The Communications Workers of America (CWA) argues that certain provisions of the NAFTA treaty would preempt some State and Federal regulations, in violation of the Communications Act of 1934. Under NAFTA, CWA argues, States would lose regulatory oversight over some aspects of domestic telecommunications, and the Federal Communications Comm ission in some areas would be Improperly subordinated to executive branch authority. USTR, which negotiated the agreement, argues that loss of such oversight is exaggerated. See John Morgan, Adm inistrative Assistant tot he Secretary-Treasurer, Communications Workers of America, "Testimony before the U.S. International Trade Commission," Nov. 17, 1992.

able to attach terminal equipment to the network. Private circuits must be connectable to the public-switched network, and users must be permitted to use their own operating protocols over these networks.

- Intracorporate and other communications may move within and pass **across national** borders of signatory countries, including those aimed at gaining access to foreign databases.

The signing parties also agreed to impose no conditions on access and use of public networks other than as necessary to safeguard the public service responsibilities of suppliers of public telecommunications networks or services. Examples are protecting the technical integrity of the networks or making sure that only services that have been agreed to are supplied.

In the view of large users, the theoretical application of GATT principles to telecommunications turned out, in the political arena of trade policy formulation and diplomacy, to be less than perfect. Some argue that U.S. trade negotiators did not push hard enough to extend market access and favorable operating conditions for big users.[28] In particular, companies find that they do not have much latitude in making arrangements for capacity resale: while they are given the right to set up networks in the first part of the annex, in another part this right is subject to restrictions, with the balance appearing to favor continued restriction. According to Michael Nugent of Citicorp, which is a major user of international telecommunications services and operator of extensive private corporate networks,

> *[t]he way the annex is shaping up, it is turning into a bill of rights for the telephone administrations and for those who seek restrictions on usage of the network.*[29]

In the view of large users, the original U.S. submission, which was not accepted, reflects a much better compromise between the U.S. Government and industry.[30] It contained substantial rights for users and service providers, whereas the current draft at many points allows a PTO or national regulatory body to limit access, usage, and bypass, in the name of safeguarding public service rcsponsibility.[31] Large users, like carriers, also believe that no agreement on telecommunications is probably better than a bad agreement. Some have argued that this would permit the negotiation of trade agreements without the hindrance of multilateral coverage.

In contrast to either U.S. industry position, EC believes that MFN under the terms outlined in the telecommunications annex should be granted now. This may be driven by institutional dynamics: EC is trying to increase its leverage over telecommunications regulation so it can enforce the agreement itself, thereby taking control of this aspect of EC economic regulation from member states. With this agreement, EC may

2a OTA interviews with service indust ry represent atives; see also Bob Davis, "GATT Talks Near Collapse at the Deadline," *The Wall Street Journal*, Dec. 18, 1991, p. Al 1.

29 Michael Nugent, Citicorp, cited in Craig Johnson, "IS There Life Still in the Uruguay Round?" *Transnational Data and Communications Report, vol.* 14, No. 2, March/April 1991, p. 7.

30 OTA interview with service industry representative, June 4, 1992.

3 Nugent, op. cit., footnote 29.

come to play a more central role on both trade and telecommunications regulation.

The problem of basic telecommunications services

The final major issue under discussion in the current round of talks on telecommunications is market access for basic telephony, specifically the ability of firms to offer basic long-distance telephone service in foreign countries. This market is open in the United States, although not without restrictions. (See ch. 1, box 1-A; for example, foreign firms cannot hold radio licenses and hence cannot directly offer some forms of long-distance service.) Long-distance services are not competitive in most other countries.

The Telecommunications Annex did not resolve the issue of liberalization of basic services. The United States wants, as a matter of policy, to promote the opening of other long-distance markets to a level comparable to its own. Therefore, at the same time that the draft Telecommunications Annex was published. USTR proposed in a derogation, or partial exemption from the general agreement, that as soon as a GATT agreement is reached (now scheduled for December 1993) the major telecommunications signatory parties will seek to agree on terms to liberalize their basic long-distance telephony markets over the next 3 years, under conditions set forth by USTR in its proposal. These conditions basically consisted of commitments by foreign governments to break up their telecommunications monopolies:

- There would be no limit on number of competitors.
- Foreign firms would be allowed to offer basic long-distance service through facilities-based competition and through resale.
- Foreign investment would be permitted in basic long-distance services.
- There would be transparent, nondiscriminatory and cost-based access to basic telecommunications services.
- There would be a fair and transparent regulatory process overseen by an independent regulatory body.

If all the conditions were met, the full basic long-distance telecommunications market would be subjected to MFN by all parties.[32] U.S. trade negotiators' reasoning for not insisting on extending MFN to basic telephone service, but including it in the derogation offer. is that other countries were not willing to liberalize as quickly as U.S. carriers would like.[33] In the absence of specific market-access commitments, other countries would have limited the liberalization of their markets while attempting to enter the U.S. market. Application of MFN to basic telecommunications services would

*U.S. negotiators hold out for furfher talks on liberalizing **basic** long-distance services.*

32 The GATT negotiating process permits countries to take derogations from specific sections of an agreement, wit h the expect at ion that these except ions will become t he focus of future trade negotiations, and will eventually be elim inated when the conditions justifying the except ions no longer pertain. This may have played a signif icant role in weakening t he large users' posit ion wit h USTR, resulting in concessions to the European PTOs.

33 Init ially, USTR did support extending MFN to basic services, but changed its position after strong protests by AT&T and MCI.

lead to less market access.[14] Linking MFN with market access as outlined by the U.S. proposal would put pressure on nations to mutually exchange commitments in order to get MFN treatment. It would make opening up telecommunications markets somewhat less difficult for some countries, in that the agreement allows better control over concessions to be granted. Finally, the U.S. proposal recognizes that MFN works when there is a large enough number of countries offering the same terms of access, thereby minimizing the problem of free riders; the U.S. position is that there is not yet a sufficient number of countries to permit this in telecommunications services.[35]

The asymmetry in the degree of market openness between the United States and elsewhere is damaging to U.S. domestic interests, it is argued, and gives away an important bargaining lever that the United States might usc in bilateral negotiations to open other countries' markets.[36] This point is of particular importance to AT&T, which reportedly vigorously lobbied USTR to refrain from applying MFN to basic telecommunications services. [37]

Other U.S. long-distance carriers differ only marginally with AT&T on these points. For example, Sprint relies heavily on international leased lines and resale of voice services in Europe, and needs an agreement that allows them to do this easily. All service providers reportedly feel that no agreement is better than one that would lock open the U.S. market without the possibility of competing in others' markets.

Divisions between the U.S. interexchange carriers and their major users on the issue of basic services reflect different positions on the amount of competition to be permitted in the United States, and the degree to which the U.S. Federal Communications Commission (FCC) will continue to have the power to control the U.S. operations of foreign carriers. After the divestiture of AT&T in 1984, when the U.S. telecommunications market was unilaterally opened (except for local service), the FCC retained authority over foreign carriers (through its section 214 filings requirement) in order to protect the interexchange carriers from unfair foreign competition in services. This could occur because foreign carriers can cross-subsidize their competitive operations from their domestic monopoly service operations.

Large telecommunications users, on the other hand, want as much competition as possible to assure themselves of favorable prices and a wide choice of services. They would like foreign carriers to operate freely in the United States. If basic services are subject to the GATT agreement, the FCC will have less ability to restrict foreign carriers operations in the United States.

This disagreement among countries, however, is symptomatic of a deeper issue: trade negotiations in GATT reflect nations' de-

[34] Ambassador S. Lynn Williams, Deputy U.S. Trade Representative, cited in Craig Johnson, "IS There Life Still in the Uruguay Round?" *Transnational Data and Communications Report, vol.* 14, No. 2, March/April 1991, p. 6.

35 Ambassador S. Lynn Williams, Deputy U.S. Trade Representative, cited in Craig Johnson, op. cit., footnote 34.

[36] Randolph Lumb, AT&T vice-president for international regulatory affairs, cited in Craig Johnson, op. cit., footnote 34, p. 6.

37 OTA interviews with representatives from USTR, Nov. 5, 1992.

sires to retain control of their telecommunications infrastructures for reasons of economic sovereignty, wealth creation, privacy protection, civil defense, and national security. To the extent that countries are concerned about loss of sovereignty, they will inflate the definition of basic as opposed to enhanced services in an effort to minimize the domain of negotiable issues.[38]

At the core of the debate about deregulation and competition and thus about tradeability of services lies the question of defining basic telecommunications services and enhanced telecommunications services. The usual technical distinction is simply that basic services arc those where messages are delivered with little or no enhancement by computer or other manipulation, whereas value-added or enhanced services are those where signals have been manipulated in some way—selected, formatted, processed, stored, forwarded, etc.[39] Basic services are assumed to be best provided by monopoly service providers, to gain economics of scale. Enhanced services, it is assumed, may be provided competitively. But efforts to arrive at clear and useful definitions for trade purposes have encountered a theoretical difficulty: there is no agreement among economists about the extent to which modern telecommunications are inherently monopolistic.[40] There is agreement that some enhanced services can be easily provided competitively; the question is how close to plain old telephone service can deregulation come without decreasing economic or social welfare, Countries that wish to protect their telecommunications market and traditional telecommunications providers seek to define as much as possible as basic services. Non-telecommunications firms that seek to offer new services seek to define as much activity as possible as enhanced or value-added.

At the core of the debate over telecommunications market access are the definitions of "basic" and "enhanced" services.

Negotiating GATT

How GATT negotiations work

GATT agreements arc generally arrived at by the mutual exchange of concessions between countries. One country may offer to reduce restrictions on foreign banking, for example, in exchange for another country lowering barriers to trade in insurance. While the classical economic theory of comparative advantage would emphasize the benefits of free trade for both the exporting

38 Peter Robinson, "Globalization, Telecommunications and Trade," *Futures,* October 1991, pp. 810-813.

39 Aronson and Cowhey argue also that a distinction between *infrastructure facilities* and *infrastructure services* ought also to be made, because control of facilities can affect the provision of competitive services. If facilities are provided only by a single monopoly telecommunications operator, then to ensure competition in services, stringent regulations must be made and enforced. Jonathan David Aronson and Peter F. Cowhey, op. cit., footnote 8, pp. 64-65. A looming question is the status of wireless communications technologies, which willlikely be international from the outset. See U.S. Congress, Office of Technology Assessment, *The World Administrative Radio Conference: Technology and Policy Implications,* OTA-TCT-549 (Washington, DC: U.S. Government Print Off Ice, May 1993).

40 GATT Secretariat, Multilateral Trade Negotiations: The Uruguay Round, Group of Negotiations on Services, Trade in Telecommunications Services, doc. no. MTN. GNS/W/52, May 19, 1989, p. 4; Jonathan David Aronson and Peter F. Cowhey, op. cit., footnote 8, p. 61. The distinction between basic and enhanced or value-added services was adopted essentially to avoid having services t hat can be offered competitively hamstrung by regulations designed for common carriers.

and importing countries, trade barriers are the consequence of political factors.[41]

Once the basic framework and the sectoral agreements are struck, the issue in GATT negotiations becomes the terms under which access to markets will be granted. This is a particularly sensitive issue where countries have monopoly service providers. An agreement to open markets under the most-favored-nation principle can hurt countries that have unilaterally liberalized earlier; MFN can lock open the markets of liberalized countries without obtaining equally open access to markets in countries that maintain a monopoly.

The United States and other countries have taken different approaches to the procedures for deciding what should be liberalized. The U.S. position, spelled out in detail in its October 23, 1989 proposal, is that every services sector should be opened unless specifically excluded (and defined in a schedule list). Exclusions or reservations would be periodically reconsidered and withdrawn when circumstances permitted, This flexible approach offers some protection to countries unwilling to embark on massive liberalization immediately, but also provides the opportunity for the United States to continue to press for market liberalization in the future.[42] Other countries argued that all services sectors should be restricted unless specifically liberalized. In the U.S. view, this would limit the number of items that could be reviewed, and would limit the ability of signatories to press for reopening issues in the future.

The United States has argued that services should be liberalized unless specifically excluded, whereas other countries believe that services should be restricted unless specifically /liberalized.

The U.S. position did not prevail. Each country agreed to put on the table its sector-by-sector offers, i.e., those specific liberalizing commitments it was willing to make. At the same time, each country was permitted to list restrictions in other countries that it wished to see removed.

Initially, no country except the United States proposed a list of offers, while the U.S. list of sectors that it wished to restrict was so short that other countries were visibly embarrassed.[43] Currently, however, there are offers on the table from 27 countries (with EC counting as one country) on all sectors of the services negotiations, with 20 proposals specifically covering telecommunications services. In the view of some U.S. observers, the offers merely describe the status quo and promise little additional liberalization.

The process of deciding what U.S. offers will be extended, while not strictly speaking secret, is largely shrouded from public view. By and large it consists of the process described below and in chapter 8, through which USTR solicits input from other government agencies and listens to lobbying by various firms, industries, and interest groups with a stake in the outcome, as required under the 1988 Telecommunications Trade Act. With the complexity of the issues, and with the paucity of data about services (discussed in chapter 8), there is no way for trade negotiators to assess the likely consequences and effects of their offers, restric-

41 Brian Hindley, "Principles in Factor-Related Trade in Services," in Patrick A. Messerlin, Karl P. Sauvant, et al., op. cit., footnote 13, p. 14.

42 Bela Balassa, "The United States," in Patrick A. Messerlin, Karl P. Sauvant, et al., op. cit., footnote 13, p. 130.

43 OTA interview with Margaret Wigglesworth, Coalition of Service Industries, June 12, 1992. See also Richard H. Snape, op. cit., footnote 21, pp. 10-11.

tions, or final agreements. It falls to the private sector to analyze the likely costs and benefits, and then to press for a negotiating position that retlects their assessments of advantages and disadvantages of any particular position. In this process, those with direct economic stakes in the outcome may have a voice, but there is no direct voice for the interest of consumers and jobholders in affected industries.

Formulation of U.S. negotiating positions in GATT

Congress is concerned about the degree of access to the U.S. market that is afforded other countries compared to the access that U.S. firms have overseas. The 1988 Trade Act established telecommunications as an area of particular concern, and directed USTR to assume the lead in both telecommunications equipmcnt and services negoti - ations. Congress' intervention, exercising its constitutional power to regulate foreign trade and commerce, reflected its suspicion of the free trade policies of recent Administrations and the reluctance during those Administrations to take action against U.S. trading partners who engage in unfair trading practices.

Congress typically does not have much interaction with USTR whilc negotiations arc proceeding. Trade negotiation documents are sometimes classified to prevent leaks that could affect the U.S. bargaining position,[44] which tends to make Congress less well-informed about the issues, some of which are highly technical.[45]

The U.S. negotiating position on trade in services and telecommunications is remarkably clear-cut for a relatively new policy issue. A number of participants note that significant policy innovation has occurred over the past decade. The fragmentation of policymaking (see chapter 8) sometimes results in trade policy conflicts, but these conflicts are usually over details of the trade agreements or over negotiating strategies, with only a few over fundamental issues. General principles of transparency, progressive liberalization, national treatment, most-favored-nation, nondiscrimination, and market access all arc relatively noncontroversial for government. network operators, equipment providers, and large users. Government and business share a common view of the benefits of liberalization in trade in services, and business plays a significant role in advising trade negotiators on their positions.

The trade negotiation positions of the United States arc formally the responsibility of USTR, in conjunction with the Treasury Department. USTR. however, has a small staff, and is dependent on other agencies for specific sector-al expertise. USTR assembles teams of negotiators from a number of agencies, such as the International Trade Administration (ITA) and the National Telecommunications and Information Administration, both in the Department of Commerce. The FCC, through its Common Carrier Bureau, plays an important role, because of its technical expertise. Representatives are also drawn from the Bureau of Communications and Information Policy (CIP) at the State Department, although CIP is thought by some trade participants and by some of its own staff to make relatively little

[44] This occurred for example during the negot iations for NAFTA.

[45] OTA interviews with USTR of ficials, Nov. 5, 1992.

contribution to trade policy.[46] The Antitrust Division of the Department of Justice is also part of the team,[47] and other agencies sometimes participate.

Formal and informal advisory committees and task forces also are consulted by USTR in developing positions. Formal committees include an Advisory Committee on Trade Policy and Negotiations, composed of chief executive officers (CEOs) of large firms, labor unions, and trade associations; and five sectoral Policy Advisory Committees, also drawn from the CEOs or executive vice-presidents of service companies. There are in addition 17 Industry Sector Advisory Committees, one of which is devoted to services.

Trade associations and lobbying groups also contribute to USTR deliberations. The U.S. Chamber of Commerce has an International Telecommunications Subcommittee that marshals and elaborates U.S. users' views, as does the U.S. Council for International Business. The International Telecommunications User Group (INTUG), based in London, speaks for users of international telecommunications here and in Europe and is a vigorous and outspoken proponent of liberalization and freer rnarket access. Its membership is composed chiefly of national communications users associations of the developed countries. A U.S. member is the International Communications Association (ICA), the largest U.S. user group, which itself deals mostly with domestic issues. Another important user group is the Coalition of Service Industries (CSI), which represents 14 very large firms.[48]

In most policy areas industry groups or interest groups line up behind different government agencies; these alignments are clear in the area of international telecommunications services.[49] The natural interest groups are:

- the dominant long-distance wrier (AT&T);
- the alternativc interexchange carriers (MCI and Sprint);
- the regional Bell holding companies (RBHCs);
- large users with an interest in operating private networks for themselvcs and others (such as EDS, IBM); and
- other, usually smaller users, with an interest in service at favorable costs and flexible operating conditions.

It appears that AT&T receives considerable support from the FCC, USTR and, at times CIP; the regional Bell operating companies from the FCC and NTIA; and alternative long-distance carriers from the FCC and

[46] OTA interviews with senior State Department officials, USTR officials, and with senior staff members of the Committee on House Foreign Affairs. A proposed reorganization of the State Department (*State 2000 Report*) indicates that CIP is to be downgraded and put under the Economics, Business and Agriculture Bureau, although the head of CI P will cent inue to enjoy ambassadorial rank, under exist ing legislat ion. CI P has suffered from being lodged in a department that is unfriendly to functional offices. See ch apter 8.

47 According to participants and observers, Department of Justice has not recently played any significant role in negotiations.

48 CSI was started in 1982 at the suggestion of William Brock, U.S. Trade Representative. Because it has only 14 members, CSI finds it easier to take strong positions on issues than most other t rade associations, whose members often have more cross-cutt ing interests on t rade issues. On t he ot her hand, because CSI has bot h large users and network operators as members, it cannot take a vigorous stand on some other user issues.

49 Chapter 8 has more detailed descriptions of these agencies and their relationships.

the Justice Department. The large users have strong support from USTR. The smaller users have only weak representation, chiefly in the Service industries branch of the International Trade Administration.

While the FCC's deregulatory orientation has largely benefited the alternative long-distance carriers and their users on the domestic level, the health of U.S. carriers in the international arena is a different question, and the FCC seems averse to policies that could harm AT&T. NTIA takes a strong promotional and supportive stance toward U.S. telecommunications operators. particularly RBHCs. The agency's *Infrastructure Report* and *Telecom 2000 Report* recognizes the importance of the domestic infrastructure in promoting economic growth and asserted that competition is the best means to promote domestic telecommunications development, but NTIA does not support trade policies that would potentially challenge domestic operators. There does not seem to be an explicit NTIA focus on users.[50]

USTR appears to be strongly influenced by AT&T and by large users, while other long-distance carriers and users complain that USTR pays insufficient heed to their needs.[51] Since USTR is at the center of overall trade negotiations, its function is to assimilate and aggregate input from a wide range of industries. USTR needs to have some distance from all interest groups in order to be able to adjust U.S. policy overall, and horse-trade with other countries. This may explain why USTR appears to many observers as standoffish.

Nevertheless, users may find a more sympathetic ear at USTR than at the telecommunications agencies. Users are drawn from a variety of industries, and so are not a natural constituency for telecommunications agencies. They typically spread their lobbying efforrts, since telecommunications is not their only regulatory or operating concern. Users' telecommunications requirements beyond plain old telephone service are also relatively new.

Long-range consequences of a GATT agreement

The success of GATT negotiations on services would represent important challenges to the traditional control of nations over their domestic affairs. With reliance on market access principles, trade officials would play a much greater role in international and even domestic telecommunications policy. This was recognized by Congress in the 1988 Telecommunications Trade Act, which gave USTR the leading role in multilateral telecommunicate ions trade negotiations.

USTR has already begun to intervene in specific telecommunications policy areas, even beyond the GATT setting. For example, USTR halted the FCC's proposed international simple resale initiative in late 1991, on the grounds that the FCC's timing on changing the ''dominant carrier regulation' would interfere with USTR's negotiations in GAIT (The FCC proposed to remove some reporting requirements on foreign carriers operating in U.S. markets; these carriers were all treated by the FCC as ''dominant

*With reliance on market access principles, trade officials play a much greater role in international and even **domestic telecommunications policy.***

[50] This maybe changing in regard to spect rum management, where NTIA has established a private sector liaison office.

[51] For example, in OTA interviews with of ficials of the International Communications Association, July 22, 1992,

carriers or monopolies with the power to restrict competition in their home markets.) The FCC complied with USTR's request to delay its action: later USTR gave the FCC its approval to go ahead. Such conflict among agencies is likely to increase.[52]

The fact that trade officials have emerged as important players in international telecommunications negotiations is important because their ministries have multiple constituencies with less specific focus on telecommunications issues than do telecommunications agencies. Some observers believe that trade officials should not be given too much authority, as they lack subject matter expertise. Furthermore, trade officials arc not necessarily concerned or knowledgeable about efforts to improve the competitiveness of national industries. In the United States, this responsibility is presumably lodged in NTIA, if anywhere, and NTIA plays a limited role in trade negotiations.

One potential consequence of the increasing trade focus of international telecommunications may be that as political leaders increasingly come to preside over international telecommunications through trade ministries, they may negotiate telecommunications trade deals that are suboptimal from the standpoint of telecommunications users or carriers, It sometimes is politically expedient to agree to trade policies, such as asymmetrical market access, which are harmful to one segment of a national industry. In other words, national competitiveness and free markets are not always compatible goals.

The web of negotiating relationships is further complicated by the fact that separately and within GATT, bilateral negotiations take place among countries, and not all countries arc party to all multilateral negotiations. The 1988 Trade Act specifically requires the President to negotiate access to foreign markets in telecommunications, and authorizes him to use sanctions if such access is not achieved (section 301). These arc necessarily bilateral negotiations:[53] parties that recently have been identified as having serious barriers to U.S. telecommunications trade are South Korea, which has reduced its trade barriers through bilateral negotiations, and the European Community,

52 Peter Cowhey argues that this may bring about an equilibrium outcome or stalemate because no one will have strong Incentives to resolve the conflict. Peter F. Cowhey, op. cit., footnote 6, p. 198.

53 The most recent example of t his is in the dispute over t he ECUtilities Directive, an equipmentissue. This directive went into effect on Jan. 1,1993, after the failure to reach agreement with the United States on the GATT Government Procurement Code. It requires that EC countries have open bidding procedures, but in the absence of an international or bilateral agreement they are to give preference to EC firms in procurements. A 50 percent EC-content requirement was established, with a 3 percent price differential favoring EC companies.

The United States is seeking the elimination of such Buy National rules in the GATT Government Procurement Code negotiations. See United States, Off Ice of the United States Trade Representative, 1992 *National Trade Estimate Report on Foreign Trade Barriers* (Washington, DC: U.S. Government Printing Office, 1992), pp. 75-76. Agreement in GATT would provide rules specifying open, nondiscriminatory procurement. Furthermore, the United States and the EC disagree on the status of the Bell operating companies and AT&T in t he Government Procurement Code. The EC claims, and AT&T has acknowledged, that AT&T preferentially buys its own equipment, known as "self -dealing." The fact that AT&T is both a service and an equipment provider causes the United States serious problems in trade negotiations.

In announcing the imposition of sanctions against the EC in February 1993, USTR hoped that the EC would waive the discriminatory provisions of the Utilities Directive.

which has not. Furthermore, with the growth in importance of computing and other electronic media in telecommunications, a complex network of standards organizations now has a role in telecommunications policy debates. [54]

Given that countries have differing telecommunications history, politics. and infrastructure, they will not all move smoothly or at the same pace from the stable domcstic monopoly/ITU model toward a relatively stable competitive market. Some may experiment with a variety of telecommunications structures and policies. This could result in persistent failure to eliminate obstacles to efficient interconnection of equipment and networks, which could hurt U.S. firms wishing to take advantage of their installed technical base, their experience, and their established operating procedures. This in turn may affect the competitiveness of U.S. companies in areas of the world that following a telecommunications trade path differ--ent from that favored by the United States.

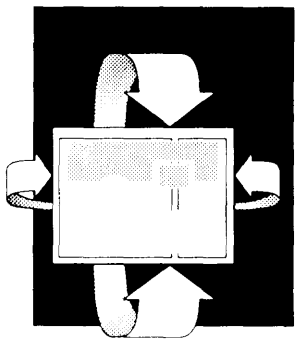
Are there clear winners and losers in the changes occurring in global telecommunications services trade patterns'? So far, there appear to be few losers. Although much of the change came at the behest of large telecommunications users, the cost reductions and improved flexibility in operating terms seems to have significant spillover benefits for residential and small and medium business users. Computer equipment and electronics firms and enhanced services providers have benefited by lowcr costs and improved terms of access. Although many services providers arc now saying that no GATT agreement is better than a bad agreement (i.e., one that would lock open the U.S. market without giving them full rights to compete in others' markets), it is likely that they will acquiesce in an agreement that has broad political support. Even organized labor, which may have less bargaining power with the opening up of the telecommunications system, expects to endorse the Uruguay Round GATT agreement, when and if it is finalized. [55]

[54] For a recent discussion of the standards-making process inrelation to U.S. competitiveness, see U.S. Congress, Off Ice of Technology Assessment, *Global Standards: f3ul/ding Blocks for the future,* OTA-TCT-512 (Washington, DC: U.S. Government Printing Off Ice, March 1992).

55 Morgan, op. cit., footnote 27.

How Telecommunications Policy Is Made

8
CHAPTER



The fragmentation of the policymaking structure invites "forum shopping."

IT IS DIFFICULT TO DEFINE U.S. POLICY FOR INTERNATIONAL TELECOMMUNICATIONS, and even more difficult to identify the locus of responsibility for its development. International telecommunications policy was for many years an incidental byproduct of domestic telecommunications policy; now it is a subheading in foreign trade negotiations. Yet, the political and economic relationships of the United States with the rest of the world depend heavily on global networks—for diplomatic and military communications; for directing business, coordinating trade, and settling financial transactions; and for the myriad cooperative efforts ranging from environmental amelioration to disaster relief that arc made necessary by today's highly interdependent global community.

This chapter first describes the governmental structure is responsible for formulating international telecommunications policy, and then relates this to the structure for developing trade policy. At best, telecommunications decisionmaking works well because it includes many fora for the expression of competing interests, and because of the commitment and cooperation of experienced people whose responsibilities have over time spanned both industry and government. At worst, decisions about international telecommunications are a secondary byproduct of international agreements reached in broad trade negotiations, and as a result may be unidimensional and shortsighted. Broader telecommunications objectives may be ignored. Conversely, international trade negotiations could be thrown awry as a result of unilateral actions by regulators. Some private sector observers fear that with negotiators powerfully motivated to reach agreement in the waning days of the current round of the General Agreement on Trade and Tariffs (GATT), there is an increasing possibility that telecommunications objectives might be sacrificed for unrelated trade objectives.

The fragmentation of the policymaking structure provides an opportunity for 'forum shopping' in which competing interests can play one agency against another. In practice, it has created a situation in which the interests and demands of major telecommunications providers and some large users are well represented, with relatively little attention to the interests of other users, including small businesses.[1] The public as a whole appears to be considered chiefly as secondary consumers whose only recognized interest is the relative prices of goods and services delivered with the aid of telecommunications.

Policy makers, regulators, trade negotiators, and consumer interests groups alike arc further handicapped by the often inadequate, incomplete, or misleading data related to telecommunications. Especially in the area of competitive trade in telecommunications services, a growing need for better data has been frustrated first by single-minded adherence to a goal of reducing industry ''paperwork burden, ' and more recently by the necessity of budget trimming.

[1] The Federal Communications Commission (FCC) is supposed to speak for small users and consumers in formulating telecommunications regulatory policy. The White House Bureau of Consumer Affairs is used by the Off Ice of the United States Trade Representative to represent consumer interests in its consultative groups advising on telecommunications trade negotiations positions. The Consumer Federation of America may also part icipate, along with the Communications Workers of America (a labor union).

The telecommunications policymaking structure

In 1978, President Carter removed an existing Office of Telecommunications Policy from the Executive Office, and by Executive Order combined it with an Office of Telecommunications in the Department of Commerce to form the National Telecommunications and Information Administration (NTIA).

This move effectively signaled a change in perspectives on telecommunications. "Shifting communications policy functions from the White House to the Commerce Department in 1978 was an effort to depoliticize communications policy, acknowledges policy analyst Howard Symons, ‘‘. . .howevcr, the move also appeared to diminish the importance of communications policy. The existence of an Office of Telecommunications Po] icy in the White House had indicated symbolically that telecommunications was a core element in national infrastructure and a uniquely valuable tool for policy implementation (although in reality this concept had seldom been exercised). ~ The move to the Department of Commerce, together with the beginning of deregulation, meant that telecommunications was henceforth viewed primarily as an industry producing goods and services for business users. “The United States is unique in regarding telecommunications primarily as a trade factor rather than as a social policy tool,” acknowledges the State Department’s first Telecommunications Coordinator.[4]

Four decades earlier, the 1934 Communications Act, which established the Federal Communications Commission (FCC), had set forth the guiding Federal communications policy as one of

> *. . . regulating interstate and foreign commerce in communications by wire and radio so as to make available, so far as possible,* to all the people of the United States *a rapid, efficient, Nationwide, and world-wide wire and radio communications service with adequate facilities at reasonable charges, for the purpose of the national defense, [and) for the purpose of promoting safety of life and property . . . . [47 U.S. C, 151].*

Commerce, national defense, and maintenance of civil order provided the rationale for Federal responsibilities for telecommunications (otherwise a state regulatory responsibility). But the major thrust of Federal policy was to achieve universal service through the regulation of rates, service offerings, and infrastructure development. That goal essentially secured. in 1978 the driving policy goals became deregulation and opening up markets for equipment and services. This effort intensified after the Democratic Administration was succeeded by a Republican Administration in 1981.

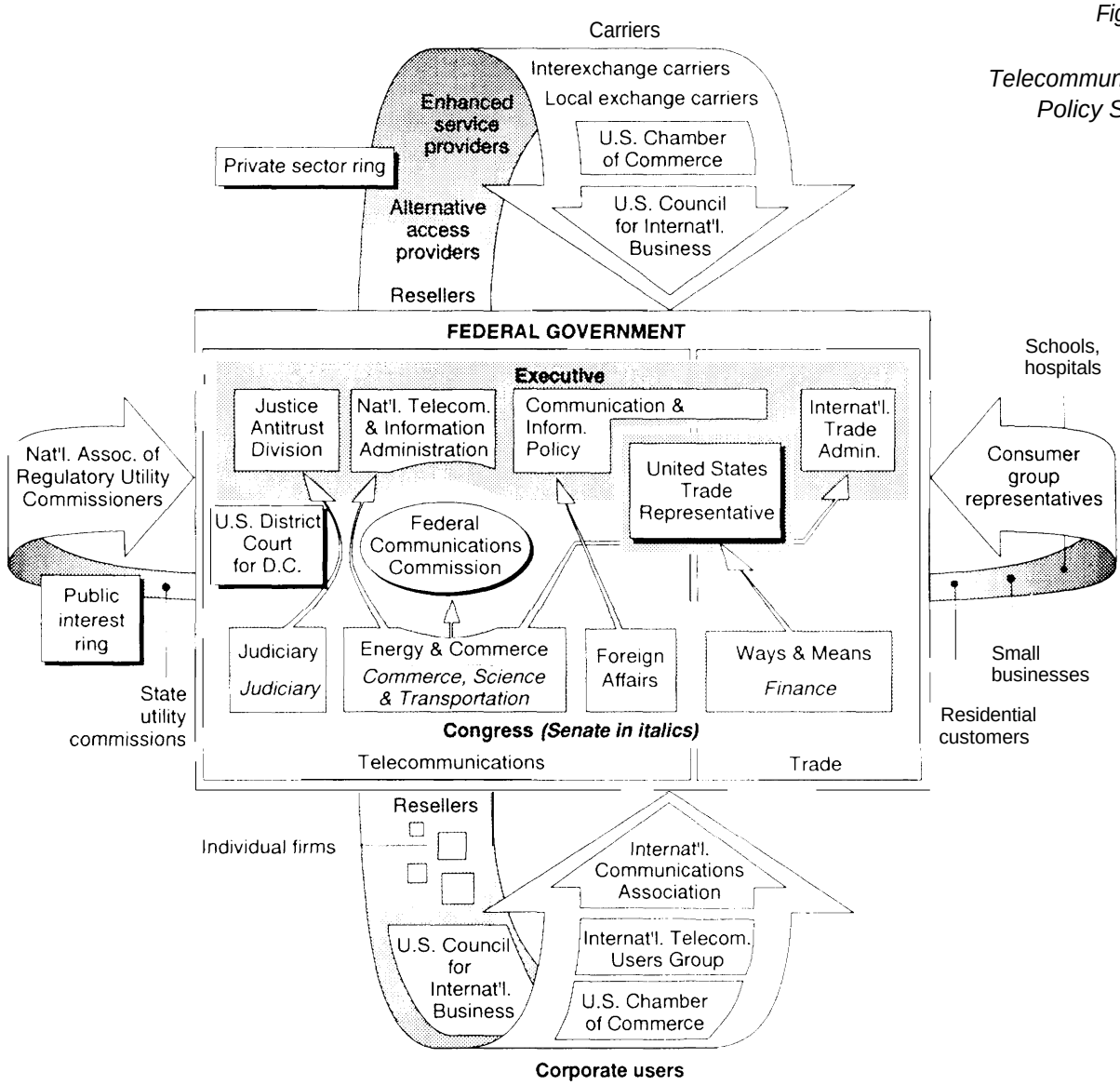
From 1934 until the mid-l980s, U.S. telecommunications policy was largely gen-

[2] Howard J. Symons, “The Communicant ions Policy Process,” in Paula R. Newberg (cd.), New *Directions in Telecommunications Policy* (Durham and London: Duke University Press, 1989), p. 299.

[3] Some observers report that the Office of Telecommunications Policy provided the origin and impetus of the move toderegulat e telecommunicate ions, and thait was ef feet ive because it wasn the Executive Office and could get the ear of the President, or at least of his most influential advisors. (OTA interviews)

[4] Ambassador Diana Lady Dougan, now at the Center for Strategic and International Studies, in d scussion with OTA staff.

Figure 8-1. US. Telecommunications Policy Structure



SOURCE OFFICE OF TECHNOLOGY ASSESSMENT, 1993

In practice, international/ teleommunications policy has effectively been made in the Office of the United States Trade Representative.

erated within the framework of the FCC's relationship with the regulated monopoly, AT&T. Since the divestiture of AT&T in 1984, a "troika' of Federal agencies has formally been responsible for telecommunications policy, through an often uneasy process of consultation and negotiation. The three agencies are NTIA in the Department of Commerce, the Bureau of International Communications and Information Policy (CIP) in the Department of State, and the FCC, which is not part of the executive branch, as are the other two, but is an independent regulatory commission. (The FCC's five-member bipartisan Commission is, however, appointed by the President.) In practice, international telecommunications policy has effectively been made by the Office of the United States Trade Representative (USTR).

In the United States, trade policy—like telecommunications policy—involves several agencies: USTR within the Executive Office of the President, the Department of Commerce and its International Trade Administration (ITA), the Department of State, and somewhat more peripherally, the Department of Justice, the Department of the Treasury, and at times, the Department of Defense.[5]

Increasingly the responsibilities of the multiagency telecommunications policymaking structure interact with and overlap those of the multiagency trade policymaking structure. USTR emphasizes that representatives of NTIA, CIP, and the FCC ''have, over the years, played an active and important role in the development and negotiations of telecommunications trade policy. ' At a minimum, this puts USTR in the *de facto* position of reconciling or coordinating the three telecommunications agencies' sometimes divergent positions.

Some participants see the fragmentation of policymaking within each structure and the uncertain borders between the telecommunications and trade policy structures as serious problems. Others see the same characteristics as a positive benefit that allows for flexibility and representation of diverse interests. At best, some crucial aspects of future international telecommunications escape all of these agencies. The complex and highly controversial issues surrounding Federal sponsorship of a national high-speed data network-i. e., the National Research and Education Network (NREN)—-have developed in or been contested by the National Science Foundation, the Department of Defense, the Department of Energy, and the National Aeronautics and Space Administration, but telecommunications agencies have been on the sidelines.

National Telecommunications and Information Administration

NTIA, within the Department of Commerce, is supposed to lead in formulating telecommunications policy and to speak for the Administration to Congress. It comments on FCC proceedings either singly or as representing Executive branch agencies. It is

[5] In addition, the U.S. International Trade Commission provides studies, reports, and recommendations involving international trade and tariffs to the President and Congress. It has a number of statutory functions related to administration and enforcement oft rade agreements, customs laws, and tariff acts. The Bureau of Export Administration in the Department of Commerce administers export controls, including export licensing and control or decontrol of technologies that may impinge on national security. Neither of these bodies is considered to develop or initiate trade policy.

a key member of U.S. delegations in various international fora. NTIA also manages the Federal Government's use of the electromagnetic spectrum. (This duty, in fact, constitutes by far the largest part of NTIA's workload as measured by staff assignments.)[6]

NTIA's Office of International Affairs prepares position papers on international trade issues, monitors private sector development of technical standards, works with the Departments of State and Defense on submarine cable issues, and oversees COMSAT and its activities in INTELSAT and INMARSAT. Its people serve on U.S. trade and regulatory delegations to foreign governments and international organizations such as the International Telecommunications Union (ITU) and Organization for Economic Cooperation and Development (OECD). A major part of the work of the Office is in preparing for international meetings; this preparation is carried on in close liaison with industry, and to a lesser extent with major user groups.

Does NTIA "initiate" policies'? That depends in part on the activism and the agenda of the Assistant Secretary of Commerce for Communications and information, who is also the Administrator of NTIA. The Administrator may, for example, initiate a "public inquiry' on policy issues, in which industry and other groups will present their often conflicting viewpoints. The public inquiry may then be followed up with a major report, such as the Infrastructure Report and the Spectrum Report, both in 1991.[7]

For the most part, however, the agency's agenda is set reactively, through responding to initiatives of other agencies within the Department of Commerce and other parts of the Administration, or to the expressed concerns of the telecommunications industry. NTIA constantly receives and responds to questions, requests, or initiatives from other agencies or from industry lobbyists. NTIA's attention has generally been concentrated on domestic issues, and particularly on the thrust toward deregulation, since that is where most of the interest of the telecommunications industry is directed, and the agency has paid relatively little attention to internaational issues. When trade negotiations are impending, however. NTIA will be asked to prepare a draft issue paper for the Office of USTR, or to review trade position papers prepared by USTR or other agencies, to help in developing a bargaining position.

The approach to all of these activities is shaped by NTIA's commitment to fostering the U.S. telecommunications industry, promoting competition in domestic markets, and opening greater access to foreign markets. Trade issues are not in fact a part of NTIA's legislative mandate, but the agency provides technical expertise in support of the agencies that take the lead in trade negotiations, and speaks to them for its industry constituents.

[6] Other mandated responsibilities include administering Federal grants to public radio and television and operating the government's telecommunications research and engineering laboratory, the Institute for Telecommunications Sciences. The Institute's main activities are spectrum-related research and systems/networks-related research.

[7] U.S. Department of Commerce, National and Information Administration, *The /infrastructure Report: Telecommunications in the Age of Information*, October 1991; and U.S. *Spectrum Policy: Agenda for the Future,* 1991.

NTIA's explicit policy has been to "encourage further infrastructure development by removing government-imposed barriers to competition and efficient investment in telecommunications facilities and markets."[8] It was the position of the last two (Reagan and Bush) Administrations that ''govcmment policies should not attempt to direct the selection of particular technologies or the pace of infrastructure investment by or for private-sector firms.'") NTIA applied the same deregulatory position to international markets, pressing other countries to allow facilities-based competition. This explicitly stated position has the possible disadvantage of limiting or removing NTIA's maneuver in developing policy or in responding to deregulatory demands of industry, or initiatives by U.S. agencies or other countries in standards-development or trade-agreement negotiating sessions.[10] NTIA tends to be seen in both domestic and international fora as representing the positions of the telecommunications industry rather than as a policy-development organ.

Henry Geller, a former Assistant Secretary of Commerce for Communications and Information and NTIA Administrator, has said that ". . . in practice, NTIA has encountered considerable difficulties. It cannot implement the policies it proposes and has had problems establishing a partnership with other agencies, particularly with the Department of State.[11]

On both domestic and international issues, NTIA's position within the Department of Commerce, not generally a powerful department, has in the past been a handicap. NTIA had trouble getting attention at a high level of the last two Administrations because there was no telecommunications spokesman in the Executive Office. This may change under the present Administration, especially since Vice President Gore has long demonstrated a strong interest in telecommunications, but there have been no clear signals of strengthened NTIA effectiveness as yet.

Federal Communications Commission

The FCC is the source as well as the means of implementation of much telecommunications policy, although as an independent regulatory commission, it is not part of the executive branch policymaking structure. The FCC was created by the Communications Act of 1934 to regulate interstate and foreign communications. The 1934 Act made it responsible for the development and regulation of both radio and wire services, and its

[8] Under the Reagan and Bush Administrations, NTIA advocated allowing the Bell operating companies to enter the information services and equipment manufacturing markets, allowing telephone companies to enter the cable television market, and allowing competition in the local exchange; and opposed legislation deregulating the cable television Industry. Positions confirmed by the Office of International Affairs, NTIA, Nov. 6, 1992.

[9] Conversations with Charles Rush, Associate Administrator of NTIA, Interview with OTA, Nov. 28, 1990. Wording oft he quote conf irmed by t he Office of International Affairs, NT IA, correspondence of Nov. 6,1992.

[10] An NTIA brochure says, however, that". .FCC or NTIA act ion to expedite the standards process could be justified. . . in areas, such as the development of standards, that would require competitors to agree on matters that could affect their relation ships." NTIA, op. cit., footnote 7, p. xvi.

[11] Henry Geller, "Reforming the Federal Telecommunications Policy Process," in Newberg, op. cit., footnote 2, p. 320.

authority now extends to television, satellite, and cable as well.[12]

The Commission is composed of five members appointed by the President, with the approval of the Senate; no more than three of the five members can be from the same party. The President designates one of the members as Chairman. The Chairman usually plays a dominant role in Commission decisionmaking.

The Common Carrier Bureau regulates international and foreign communications services provided by common carrier.[13] Other bureaus and offices also participate in international issues and organizations.[14]

The Common Carrier Bureau has always overwhelmingly emphasized domestic interstate communications with relatively littlc attention to international aspects. This may be changing, as evidenced by the concerted attention recently given to accounting rates, the dominant carrier status for international firms. and other issues discussed in this report. The FCC is considered by many in the industry to have ''unilaterally opened the U.S. market to foreigners, and it is criticized for doing so without determining whether there is the same degree of openness in foreign markets. For example, the FCC was criticized for allowing Spains Telefonica to buy the Puerto Rico Telephone Company in early 1993. The FCC has managed to maintain its authority over foreign operators in this country.

The Commission has a Director of International Communications, who is responsible for representing it in international fora and for coordinating FCC activities and policies that relate to international issues. The International Communications Office carries out these coordinating functions, but is small and relatively new. It lacks the clout commanded by the largcr Common Carrier Bureau, which can bring to trade negotiations, for example, greater technical and legal expertise and experience.[15]

Under the last two Administrations there was no telecommunications spokesman jn the Executive Office; this may change.

[12] The Communications Act gives the Comm ission responsibilit y for, among other things: 1) the allocation of spectrum for nonfederal uses; 2) the assignment of licenses for broadcast, satellite, common carrier and private radio services in interstate and foreign commerce; 3) the monitoring and regulation of tariff ing, cost allocation, and interconnection of common carriage service; 4) type acceptance and registration of telecommunications equipment; and 5) the development of communications policy and rules in these and related areas. The CommunicationsSatellite Act of 1962 gave t he FCC specific authorit y to regulate Comsat in the provision of international satellite services. FCC authority has been supplemented with the Cable Television Consumer Protection and Competition Act of 1992.

13 A "common carrier" is an organization that provides transm ission communicant ions services to t he public for hire, and that must provide services to all who wish them, at established rates. Common carriers offer services over landline wire, (electrical or optical) cable, point-to-point m icrowaveradio, land mobile radio including cellular systems, or satellite systems.

[14] The Mass Media Bureau is responsible for policy and rulemaking in the areas of traditional broadcasting, cable television, and emerging video technologies. The Private Radio Bureau regulates private radio use. In addition, t he Off Ice of Engineering hasresponsibilit y for frequency allocat ion and technical standards, and the Field Operations Bureau is responsible for radio enforcement activities. All part icipate in, for example, proceedings of the International Telecommunications Union.

[15] The Office of International Communications (OIC) notes t hat it "is not intended to replace [the] technical and legal expertise and experience" oft he Bureaus. Trade issues often cut across a num ber of bureaus and offices and are coordinated by OIC; since these issues most often concern common carriers, "continued participation in trade negotiations by the Common Carrier Bureau is deemed essential."

Because of the way the Commission is appointed, it clearly reflects the party and policy orientation of the President.[16] Nevertheless the FCC's relative independence is attested to by the fact that it is sometimes spoken of within the executive branch agencies as "a congressional agency. ' FCC decisions, as directives of an independent regulatory agency, are not subject to presidential veto, yet these decisions may have important international ramifications (as in recent FCC decisions on accounting rates). Critics speak of a ''presidential veto issue,' arguing that ''when FCC gets into international policy it is intruding on Presidential turf. ' ''7 This is a source of some strain between the FCC and executive agencies.

The Department of State and the Bureau of Communications and Information Policy

After the Office of Information Policy was taken out of the White House, it became clear that some mechanism was needed to "coordinate''—or mediate-–between NTIA, the FCC, and other agencies sometimes involved in telecommunications policy issues. Tension often ran high between NTIA, with its pronounced pro-competition stance, and the FCC, which some critics (in the executive branch) said was less wholly committed to free market ideas, at least where these would diminish its own authority.

The Department of State was an unlikely site for coordination of international **telecommunications** *policy among 14 Federal agencies.*

The Administration that took office in 1981 reportedly did not want dominance in setting telecommunications policy lodged either in the FCC, a nonexecutive agency, or in the Department of Commerce, [18] which fell within the oversight of active congressional committees that would have their own telecommunications agenda.

The position of U.S. Coordinator for International Communications and Information Policy was therefore created by statute in 1983, placed in the State Department, and assigned the rank of Ambassador. The Bureau of Communications and Information Policy was established by the Department to support this position. The Coordinator was to chair a Senior Interagency Group that would be the primary coordination mechanism for about 14 Federal agencies and subagencies.

The Department of State was an unlikely site for coordination of telecommunications policy, since the desired coordination was to apply to domestic as well as international issues and since the Department has never been a hospitable environment for scientific or technological initiatives. Its science-related divisions have not had much power or prestige. However, this location could be justified on the grounds that it was necessary for the United States to speak with one voice in international teleccommunications fora. It also gave leaders of congressional trade and foreign affairs committees some oversight over international telecommunications (the House, in 1983, was controlled by the Democratic Party while the Republican Party

[16] The former Chair of the Commission, Alfred Sikes, pointing out that telecommunications deregulation began under President Carter's Administration, has said that recent telecommunications history would be only a little different under a Democratic president. (Remarks at a Sem inar on "Transatlantic Competition: U. S.-U.K. Stakes in the Telecom Regulatory Game," Nov. 5, 1991.)

17 Interview (Nov. 18, 1990) with Ambassador Diana Lady Dougan, former Coordinator for Communications and Information Policy, now at the Center for Strategic and International Studies, Washington, D.C.

18 Interview with Dougan, cited, footnote 17, Nov. 28, 1990.

held the Senate and the White House). Finally, the State Department had the advantage of being somewhat removcd from the internecine struggles cm the domestic scene over divestiture and deregulation.

CIP is designated in legislation as the principal adviser to the Secretary of State on international telecommunications policy issues, and as ‘ ‘coordinator with other U.S. Government agencies and the private sector in the formulation and implementation of international policies relating to a widc range of rapidly evolving communications and information technologies."[19] The Bureau is the official overseas spokesman on telecommunications issues and to some extent on trade issues related to telecommunications. CIP is not however empowered to negotiate legally binding trade treaties, as is USTR.

In reality, CIP acts in international fora as the spokesperson and facilitator for teams made up of industry reprentatives and experts drawn from other Federal agencies.[20] CIP has a very small staff and little technical expertise: State Department policy has been to depend on industry expertise. On these national delegations, there may be “user group" representation, drawn chiefly from multinational corporations that rely heavily on telecommunications networks, but there is no provision for direct representation of a more general public interest except as may be assumed to be represented by the FCC.

Only in its first few years did CIP actively exereise its role of coordinating Federal communications policy development among the various agencies. It now confines itself chiefly to an administrative role in coordinating participation in international conferences, and is not considered by other agencies to be a serious factor in developing policy positions. It has been ineffective as a generator, implementor, or articulator of policy. The real coordination among agencies on telecommunications policy comes about less fomally, through the interactions of a relatively small group of people who have, over the last 10 or 12 years, moved about the Washington telecommunications scene, holding positions in two or more agencies and in the Washington offices of telecommunications firms and industry associ at ions.[21]

The Department of Defense (DOD), with a broad mandate to protect national security, with broad telecommunications networks of

[19] *The United States Government Manual*, 1991/92, p. 429.

[20] For example, a U.S. delegation cochaired by CIP and NTIA to an ITU meeting in Prague in November 1991, Included 35 people, including 11 from government (NTIA, CI P, the FCC, and Office of Technology Assessment) and 24 from industry and law firms. (The Agency for International Development was represent ed, but not USTR or ITA, since t his meet ing d id not involve t rade negotiat ions.) The In dust r y people were sent by the long-distance common carriers and Bell operating companies, mostly from their Washington government affairs offices, Several equipment manufacturers and investment bankers attended, as well as some lawyers representing their own firms.

[21] The Off Ice of Technology Assessment has identified at least 11 people who have served in the top levels (division or bureau chief and above) of at least two of the three telecommunications agencies in the last 15 years. Many more have served at lower levels in two or more of the agencies. This is neither unexpected or negat ive; there are a limited number of people with the required expert ise wi lling to work in government rather than in Industry, with itshigher pay.

its own,[22] and as a major user of public telecommunications networks, often has a strong influence over telecommunications policy. DOD opposed the divestiture of AT&T on grounds of national security, but was overruled. It has been responsible for some restrictions on the export of telecommunications equipment. DOD opposed the separate satellite policy pushed by the FCC and NTIA; this dispute was mediated within the White House, (During the first years of CIP there was regular coordination between the Communications Coordinator and DOD, the CIA, and the National Security Administration, but this was allowed to lapse.)

The Department of Justice is almost always present at trade negotiations. The antitrust division of the Department of Justice has been deeply involved in promulgating and implementing domestic telecommunications policies since divestiture. While its judgments do not enjoy extra-territoriality as a general rule, it continues to affect the overseas as well as domestic behavior of U.S. telecommunications firms and services providers because of the respect, or fear, with which it is regarded by corporate lawyers.

Increasingly there is a strong need for better coordination not only among those agencies that deal with telecommunications policy but between them and agencies that develop and implement trade policies. As the telecommunications industry is restructured because of deregulation, globalization, and technological change, the need for an improved policymaking structure will become more pressing. Because of the inclusion of trade in services in the current round of GATT negotiations and the special attention paid to international telecommunications in the integration efforts of the European Community, and also because of international disagreements over accounting rates and a variety of other issues identified in this report, there is increasing interaction between telecommunications and trade agencies. The need for coordination is also greater, to make sure that these interactions are based on a consistent, collectively developed policy that takes into account the full range of national telecommunications goals and objectives.

The policymaking structure for trade in services

Trade policy, because of its important role in national economic affairs, is assumed to be made at the top levels of government, in Congress and in the Executive Office. The Constitution allocates to Congress the power "...to regulate Commerce will foreign Nations. . .' (Art. I, sec. 8), but the details of trade policy implementation, and even its development, arc largely generated in the executive branch. For more than a decade U.S. trade policy has been strongly aimed at broad access to markets and the progressive dismantling of trade barriers. The source of this policy appears to have been rooted in a broad, although not universal, political consensus, analytically supported within the Executive Office by economic advisers to

22 Note that DOD has an Assistant Secretary for Command, Control, Communications, and Intelligence who is responsible for computing, systems security, telecommunications, and information management within the military system.

recent President\.~? The Department of Commerce helps to provide background infomation and contributes to the development of policy. but the lead agency for the United States in all foreign trade negotiations and agreements is USTR.

United States Trade Representative

All foreign trade negotiations, at least in theory. are conducted by USTR. For telecommunications, the 1988 Trade Act specifically gives USTR the statutory mandate to conduct all trade talks. USTR negotiators work from position negociated among contending domestic interest groups and usually approved at the upper (political) levels of the government. These policy positions begin with paper-s prepared by USTR in consultation with various agencies. In the case of telecommunications services or equipment issues, NT I A, the FCC, CIP, and sometimes the Department of Justice, as well as trade - related agencies. will be involved. USTR points out that the diverse inputs to fomulating telecommunications trade policy are beneficial because they reflect the highly diverse nature of the current telecommunications environment and permit relevant constituency groups to be represented in trade policy development.

Where there are incconsistencies or disagreements in the positions of the agencies, these problems are mostly worked out in informal meetings and telephone communications. If they recquirc slightly more formal negotiations they may go before an interagency *Trade Policy Staff Committee (TPSC).* Neither NTIA nor the FCC has a seat on this committee, FCC because it is not an Executive agency. NTIA because the Department of Commerce is represented by the International Trade Administration. Representatives of both NTIA and the FCC attend meetings as observers, and USTR emphasizes that ‘‘for a number of years both agencies have played key roles i n developing and participating in trade policy negotiations.

TPSC is described by some inside observers as ‘‘a central point for policy formulation." Thus. it matters that the two telecommunications agencies do not have a strong voice in TPSC deliberations. For example, according to some participants or observers, there have been times when international bilateral discussions being pursued by the telecommunications” agencies were authoritatively ‘‘subordinated to GATT’ by the TPRC. Even at the level of the TPRC there is sometimes strong and persistent interagcncy disagreement; there will then be negotiations at the agency-head or Assistant Secretary level, where an *Interagency Trade Policy Rview Group* resolves issues among Departments.

For international negotiations on trade issues, whether they are to be bilateral or multilateral (for example, the Canadian Free Tradc Agreement and GATT negotiations), USTR will assemble a negotiating team. The negotiations are led by USTR staffcrs, who arc not sector-specific specialists; this makes the team as a whole and its associated experts very important. For trade issues involving telecommunications services. the delegation would typically includc people from the

The lead agency for all foreign trade negotiations- including those on telecommunications —is USTR.

23 For a reasoned exposition of the rationale underlying the official U.S. position on trade barriers, see Geza Feketekuty, *International Trade in Services* (Cambridge, MA: American Enterprise Institute, 1988). For an opposing point of view, see Clyde V. Prestowitz, Jr., Alan Tonelson, and Robert W. Jerome, “The Last Gasp of GATTism,” *Harvard Business Review,* March-Apri l 1991,

FCC's Common Carrier Bureau and International Communications Office, from NTIA, from ITA's Office of Telecommunications, from the State Department's CIP and Economics and Business Bureau, and from the Department of Justice. Industry representatives are consulted but are not on the official delegation.

Private sector representatives (both telecommunications firms and large users) are consulted throughout the process of developing USTR's negotiating positions. USTR has a formal and informal industry liaison structure and holds frequent meetings with a cross-section of industry representatives. For example, on telecommunications issues, meetings may be called to try to develop a consensus among representatives of long-distance carriers, Bell operating companies, enhanced services providers, and other user groups as well as the formally constituted Services Policy Advisory Committee. The U.S. Chamber of Commerce has a Task Force on Telecommunications, and both it and the U.S. Council on International Business frequently advise and counsel USTR. Inevitably, however, tensions among competitors and between sectors of the industry are reflected in wrangles about the negotiating positions of USTR.

State regulators, the Consumer Federation of America, and the Communications Workers of America (a labor union) also are consulted in developing USTR negotiating positions. However, some of their representatives complain that their participation in the process is usually invited well after the critical elements in the negotiating position have been worked out between USTR, carriers, and large users.

International Trade Administration

In development of foreign trade policy, the Department of Commerce acts as liaison between industry and government, and in most cases, is assumed to speak for industry to the rest of government. This is formalized at the top levels of the Department in 25 Industry Sector Advisory Committees (ISACs), jointly administered by the Department of Commerce and USTR. Among these are ISAC V, which deals with electronics, including telecommunications equipment, and ISAC XIII, which deals with services, including telecommunications services. Although the United States, as well as other advanced industrial countries, is often said to have a "services' economy, at least until recently services were presumed to play a minor role in export trade. This may explain why only 1 of 25 ISACs deals with the services sector, in spite of its wide diversity.

The mission of ITA, within the Department of Commerce, is to aid U.S. companies in developing and participating in export trade by promotional events, provision of analytical services, and other forms of advice and assistance. ITA interfaces with companies and industry associations through constant meetings, telephone calls, etc.[24]

ITA has a Foreign Commercial Service, an International Economic Policy Section (with country desks), an Import Administration Section, and a Trade Development Section. Included in the latter is an Office of Telecommunications, with a staff of about

24 Much of the descriptions in this section rely on interviews with ITA personnel, including Roger Stechschulte, Director of the Trade Development Section (Aug. 14, 1991), and Ivan Shefrin, Industry Trade Specialist in the Office of Telecommunications (Aug. 14, 1991 and June 23, 1992).

15 people. Its tasks include counseling companies on the potential and characteristics of foreign markets, helping firms compete on major telecommunications procurements, preparing competitive assessments of industry sectors, and writing chapter-s on telecommunications for the Department of Commerce's annual *Industrial Outlook* and other trade-related reports. [25] Other assignments, chiefly of an analytical nature, may originate in requests from the Secretary, other Federal agencies, or industry, to help in developing policy positions within ITA and upper levels of the Department of Commerce,

In the first years of the communications Coordinator and the State Departments CIP, a formal telecommunications attache program was established in key foreign ports to support trade in telecmmunications services and work closely with ITA, This program, along with some other activities of CIP, has been allowed to lapse.

The adequacy of data for decisionmaking

Data on international service trade are poor.

The fragmentation of policy responsibility becomes more troublesome because it is compounded by lack of data needed to monitor trends and detect problems.[26] The great expansion of international trade in services increases the need for data to assess its status and outlook. It has, however, long been recognizcd that the dimensions of international trade in services are poorly defined, the real volume and value of transact ions is uncertain, and the data available to analysts and decisionmakers is inadequate.[27] Moreover, since the Paperwork Reduction Act of 1980, Federal policy has been to reduce the amount of data reporting required

25 The analysts use data from the Department of Commerce's Bureau of Economic Analysis and Bureau of the Census, and from other sources; the ITA itself is not a collector of primary data.

26 A report prepared for the Office of Technology Assessment identified many limitations and inadequacies in data relevant to telecommunications issues. Louis Feldner, Feldner Telecom Consulting, "The Status of Data Collection on International Telecommunications Services Between the U.S. and Europe," Sept. 1, 1992. This report was based on review of FCC filings and dockets, a literature search, and over 45 direct or telephone interviews with current and former Federal agency employees, representatives of major carriers, representatives of trade associations, and other experts.

27 A.Y. Kester, *Behind the Numbers: U.S. Trade in the World* Economy, Report of the Panel on Foreign Trade Statistics, National Research Council, 1992. Theoretical and empirical problems in measuring services delivery or export are complex and longstanding. The same services (for example, data processing) may be imbedded in technology (a magnetic tape or floppy disk) or may be delivered electronically. Many services cannot be counted at the border as can goods. Many must be created and delivered simultaneously, but services delivered by an affiliate or subsidiary overseas are not counted in trade figures.

The Council of Professional Associations on Federal Statistics has also criticized government data collection (Annual Report, 1991). The Office of Technology Assessment in 1986 and again in 1987 strongly called attention to deficiencies in the data on services, saying they were "subject to major sources of error." U.S. Congress, Office of Technology Assessment, *Trade in Services: Exports and Foreign Revenues,* OTA-ITE-316 (Washington, DC: U.S. Government Printing office, September 1986), p. iii; and U.S. Congress, Office of Technology Assessment, *International Competition in Services: Banking, Building, Software, Know-how,* OTA-ITE-328 (Washington, DC: U.S. Government Printing Office, July 1987).

Much information that was once concentrated and routinely reported is now dispersed or proprietary, unavailable to policymakers.

of industry. This policy has been strongly criticized.[28] Congress called for better trade data collection in the Trade and Tariff Act of 1984 and again in the Omnibus Trade and Competitiveness Act of 1988. Recent NTIA reports have also pointed to important gaps in data.[29]

In response to such criticism, some steps have been taken to improve coverage,[30]" but all efforts to increase data collection or change reporting requirements are still given stem scrutiny by the Office of Management and Budget (OMB) in the Executive Office of the President. In 1991, President Bush approved a multiyear initiative involving all major statistical agencies to implement recommendations developed by a working group of the Economic Policy Council. Throughout the government, however, progress has been slowed or reversed by budget cuts. Major statistical agencies lost 13 percent of constant-dollar funding and more than 10 percent of their staff from 1980 to 1988.[31]

It might be expected, in spite of these problems, that data on telecommunications services would be plentiful and readily available since this is an industry still dominated by regulated monopolies and for which there have long been international coordinating mechanisms. Here too, however, there are often inadequate data. For example, it is nearly impossible to develop comprehensive or consistent data about patterns in or changing levels of investment in physical infrastructure and in research and development since the burgeoning of overseas investment by U.S. telephone companies. This information is needed by Federal and state regulators to address the question of whether there is a possible decline in telecommunications investment.

Much of the data now reported by telephone operators in Europe and in the United States are considered proprietary and confidential since competition has become a factor,[32] and much of the rest are not comparable across national boundaries. In the United States the divestiture of AT&T and the proliferation of large numbers of alternative carriers, resellers, and value--added services networks means that much information that was once concentrated and routinely reported is now widely dispersed

[28] Katherine K. Wall man has argued that "Federal statistics need to be evaluated in terms of their intrinsic worth. . . not merely as the burden they might impose."" Losing Count: The Federal Statistical System," *Population Trends and Public Policy, No. 16* (Washington, DC: Population Reference Bureau, September 1988).

[29] U.S. Department of Commerce, National Telecommunications and Information Information Administration, *The* /infrastructure *Report,* 1991, and U.S. *Telecommunications in* a *Global Economy,* 1990

[30] B. Ascher and O. Whichard, "Developing a Data System for International Sales of Services: Programs, Problems, and Prospects," P. Hooper and J.D. Richardson, *International Economic Transactions: Issues in Measurement and Empirical Research* (Chicago, IL: University of Chicago, 1991) conclude that efforts to improve U.S. statistics on trade in services have resulted in "a lengthy list of improvements." See also "Technical Notes" in BEA, *Survey of Current Business,* June 1989, for a description of some recent improvements to U.S. data on international services.

3 David Hamilton, "Blind Data," *The Washington Month/y,* October 1991, p. 41.

[32] Since the mid-1980s some nations that have deregulated customer telephones do not even make public the number of telephone lines or stations. Feldner, op. cit., footnote 26.

and less subject to mandatory reporting.~1 The loss of a central point for data collection both in industry and in government is causing problems for international telecommunications organizations and for trade reporting organizations.[34] More and more services are provided by unregulated networks that do not report data at all.

There are two Federal primary data collectors for international telecommunications: the FCC and the Bureau of Economic Analysis (BEA) in the Department of Commerce. Both have statutory mandates to collect some data, and legal authority to obligate respondents to furnish some data. Both make most of their data available to the public, and therefore to public interest groups, by periodically reporting aggregated data and publishing reports on international telecommunications. However, the FCC collects international revenue and traffic data relevant to its regulatory mission, and in format ion about international trade is incidental to that purpose. BEA collects a wide range of trade data including some on telecommunications services. Both gaps and overlaps of coverage arc fortuitous.

BEA is legally prohibited from disclosing data of individual companies; FCC data on individual companies is, for the most part, public, although data on international operating agreements, licensing arrangements, and authorizations and concessions to foreign entities is classified confidential.[35] The FCC does not have the resources to thoroughly check and verify data submitted by the private sector, so for the most part it is merely assumed to be complete, accurate, and comparable.

All international carriers must report traffic and revenue data to the FCC each July 31 for the preceding calendar year; current data arc never available. FCC data is on international message telephone services (IMTS) and non-IMTS (private lines, record messages, etc.). Most of the available statistics deal with voice messaging, not with data transmission and value-added services, which will be especially important in the future.

33 Feldner reports that there maybe more categories of carrier services reported to the FCC since divestiture, but the nature of these reports is not as detailed as in the past and there are fewer FCC staff to conduct thorough data reviews. Feldner, op. cit., footnote 26, p. 9. On the other hand, U.S. international transactions in telecommunications services used to be reported to t he Bureau of Economic Analysis on a voluntary basis but are now mandatory reporting, beginning with 1988 data.

34 For example, AT&T publishes *The World's Telephones,* but no edition has been published since 1988. More than 30 percent of the world's carriers do not report any Information, and some of the world's largest countries (including Germany, the United Kingdom, China, India, and the former U. S. S. R.) have not reported any Information since 1979.

35 See CFR 47, chap. 1, par. 43.51. Carriers can request confidentiality on the grounds that public access to the data would cause "competitive harm." The FCC grants requests for confidentiality at its discretion, and says it is generally reluctant to do so. The public may oppose such requests for confidentiality and could invoke the Freedom of Information Act. Carriers providing data on international service to the FCC may request confidential treatment for reported data on operating agreements, licensing arrangements, and authorizations and concessions to foreign entities Involved in providing foreign services. The amount of data that is classified is not reported. This confidentiality could affect the ability of policymakers and congressional oversight committees to gauge the competitive impact of FCC decisions on the market.

Other Federal agencies, such as NTIA, sometimes conduct public inquiries or publish studies of trade in telecommunications services, but these generally do not produce new primary data or build consistent time-series data banks,[36] U.S. trade agencies depend on the FCC and BEA for primary data.

BEA has instituted mandatory annual surveys of selected services transactions that cover basic and enhanced telecommunications services; previously, on] y data on basic transmission services were available and only from carriers that voluntarily submitted data to BEA.[37] The FCC has begun collecting traffic data for U.S.-Canada and U. S.-Mexico traffic, which was not collected before.

Both the FCC and BEA are modifying their data collection and reporting mechanisms or installing new data systems. The FCC's attempts to revise its data collection have sometimes run into resistance from OMB, and also suffer from '*institutional lag.' ' As a regulatory body operating under the rules of the Administrative Procedures Act, the Commission is subject to detailed procedural requirements, which require provision for public comment before a major change in data collection rules. This has, for some changes, taken as long as 6 years.

An Interagency Task Force on Services Trade Data was established by USTR in 1982, but became inactive in early 1991 for over 18 months; it began meeting again in September 1992.[38] All participants seemed to agree that efforts to improve the collection of international telecommunications data, slowed by budget cuts, are not keeping pace with accelerating changes in the structure of services and the nature and volume of their trade.

Conclusions and options

International telecommunications policy has become more important in the last few years, as foreign markets for communications services and equipment began to open to U.S. competition. It is perhaps not surprising that U.S. policymaking about international telecommunications has been a combination of domestic regulatory policy (focusing on deregulation) on the one hand and general trade or export policy (opening up foreign markets) on the other. Thus a consis-

[36] The Census Bureau also collects data on communications services establishments. Its *Annual* Survey of *Communications Services* identifies firms engaged in providing point-to-point communications services including telephone, telegraph, other message communications (such as E-mail, facsim ile, and telex), radio and television broadcasting, cable television, and other communications services such as satellite Earth stations. The survey provides estimates of operating revenue and expenses, and it breaks out telephone communications by local, long distance, and t ype of customer. However, it does not break out international services. The Census Bureau is undertaking its largest program expansion in over 40 years in the 1992 Quinquennial Economic Census, including expansion of coverage of communications. This will not include data on international services but it is possible that the next economic census, in 1997, will do so. (Information provided by Dennis Shoemaker and Mary Beth Morris, Division of Business Services, Bureau of the Census).

37 According to Obie G. Whichard, Chief of the Research Branch, International Investment Division, BEA, Oct. 26, 1992.

38 In 1989 the Interagency Task Force set up a Working Group on Information, Computers, and Communication Services.

tency is established between the two, but the increasing dominance of USTR in telecommunications issues tends to override or restrict consideration of other goals or interests.

Currently, most of the effective decisionmaking about international telecommunications within the executive branch appears to be done by the Office of the United States Trade Representative, with NTIA in a secondary, contributing role. The FCC sometimes plays lone wolf, taking actions that may be out of step. mistimed, or discordant with the views and objectives of trade negotiators. Both the telecommunications industry, large telecommunications users, and regulatory officials fear trade negotiators may make tradeoffs that they regard as undesirable or may inadvertently lock into binding agreements old categories and distinctions that could become technologically obsolete (for example, de fin it ions of basic and enhanced services).

The development of telecommunications" policy within the executive branch is a process of continuing arbitration or negotiation among several agencies, sometimes brought together only by their collective resistance to policies proposed by Congress, or to judicial mandates. The latter have been almost entirely directed at domestic, rather than international, activities and structural characteristics of the industry.

National policy with regard to international telecommunications-so far as there is such a policy-may be both too narrow (driven by trade considerations alone), and at the same time unfocused and ineffective. The single-minded emphasis on opening foreign markets is not the same thing as fostering the competitiveness of U.S. firms in foreign markets, both because there are tradeoffs to be made in negotiating such agreements and because it may neglect other factors necessary to enhance competitiveness (e. g., standards development, financing, domestic regulatory changes, antitrust considerations, etc.). An effective competitiveness-enhancement policy implies a more integrated telecommunications policy than now exists.

There has, for example, been little attention given to long-range issues of standards-setting, interoperability, or infrastructure development. Europe and the United States increasingly tend to differ in the approach to network architecture. In Europe, relatively more centralized ''intelligence' (computerization) is integral to the network, while in the United States there is a tendency to use sophisticated terminal equipment, owned by the user. There are many advantages to the latter approach, but building advanced capabilities into the network may facilitate advanced uses of telecommunications by middle-sized and even small firms that could not afford the specialized customer premises equipment. In a global economy, the competitiveness of smaller firms may turn out to be important; smaller firms have a better track record in the United States of creating jobs than have large corporations. Telecommunications policy, not trade policy, is the appropriate vehicle for considering strategic alternatives of this kind.

Effective development of an international telecommunications policy may require reorganization or strengthening of the policymaking structure for telecommunications. It is becoming increasingly obvious that ¨. . . Domestic telecommunications policy

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Without coherent vision of what telecommunication networks should be, the United Sfates will be at a disadvantage as national networks merge into global networks.

choices have international components and effects,"[39] and that the reverse is equally true. The lack of coherence and integration in telecommunications policymaking has been recognized as a problem for many years. A 1951 Communications Policy Board established by President Truman found that telecommunications problems were being dealt with on a "piecemeal basis" with little prospect for developing "a total national communications policy."[40] During the 1960s and 1970s there were proposals from many sources for reorganizing or reforming the policymaking structure.[41]

Some commentators have proposed "a single, integrated, Executive branch agency. [42] This does not, however, fully recognize the responsibility of Congress for telecommunications as a mode of interstate commerce and international relations, or the persistent necessity of balancing or prioritizing competing goals for telecommunications. It is necessary in policymaking not merely to resolve the differences in interests within the telecommunications industry, or between large producers and large users. but also to mediate among competing ''public interests, ' such as domestic universal service (defined in modern terms of advanced network technology), competition in world markets, state-of-the-art infrastructure, consumer equity, continuing innovation, reliability, and broad interoperability. The sometimes conflicting demands made on a national telecommunications system (or more accurately, merging public and private systems) is testimony to the central importance of telecommunications in modern society. Without a coherent v is ion of what telecommunications networks should be and do, the United States will be at a disadvantage as national networks merge into global networks and international rules of cooperation and trade are developed.

Given this complexity, there will continue to be a need for executive branch statement of a national telecommunications policy that can reconcile the views of diverse interests. There will continue to be a need for broad Congressional direction and legislative mandates to provide the framework for national telecommunications policy. Finally, there will continue to be a need for an independent bipartisan regulatory agency like the FCC that implements those legislative mandates.

This indicates the importance both of attention to telecommunications a t the highest level of policy fomulation, and of an effective coordination mechanism at the agency level where the details of policy are developed. The legislatively-designated coordination mechanism is the Communications Coordinator within the Department of State; to provide staff support for the Coordinator, the Department created the Bureau of International Communications and Information Policy. CIP, as it is now constituted, is not an active and effective coordination mechanism for interagency activities and policies. That role has been partly filled by USTR, in the course of carrying out its duties

39 Symons, op. cit., footnote 2, p. 294.

40 Symons, op. cit., footnote 2.

4 For example the Presidential Task Force on Communications Policy (the "Rostow Commission") in 1967-1968, the Ash Council in 1971, and other initiat ives described by Howard J. Symons, op. cit., footnote 2, and Henry Geller, op. cit., footnote 11.

42 For example, Henry Geller, op. cit., footnote 11.

under the 1988 Trade Act. But USTR is not a suitable vehicle for intenational telecommunications policy coordination, because its responsibility extends only to trade relationships.

CIP had, and still has, a potential advantage as the locus for coordinating telecommunications policy. CIP's location in the Department of State appropriately extends Congressional oversight of telecommunications policy to a broad range of Congressional Committees. including those concerned with foreign relations and with trade. This meets the need to consider many national goals and interests in formulating teleccommunications policy--epecially when treaty obligations must be evaluated in the light of Federal and State responsibilities and perogatives. The Department of State also has experience in operating at the interface of domestic and international policy and speaking for the United States in international fora of many kinds.

However, CIP also has serious disadvantages as a mechanism for effective telecommunications policy coordination. It has a small staff, without depth in technical, engineering, and regulatory expertise; it is there - fore almost entirely dependent on industry- and especially on the narrow segment of industry that is able to invest considerablc money and personnel to participate in international meetings and negotiating sessions. These are large corporations. In attempting to "coordinate the initiatives of one or more executive branch agencies and those of an independent regulatory body (the FCC is generally considered to be a "congressional agency")—all of which operate primarily on agendas framed around domestic issues—CIP is doubly handicapped by its location in the State Department. It is regarded by the other agencies as peripheral or irrelevent in domestic policy struggles that shape the sister agencies own approach to international telecommunications. It is also regarded as peripheral in agenda-setting and decisionmaking within its own department, where technological questions arc seldom at the forefront. The Department of State has generally neglected science and technology in managing international relations and its technology-oriented bureaus have had little clout with departmental leadership. The *1992 Report by the Carnegie Commission on Science, Technology, and Government* blamed this on the prevalence of 'gentlemen diplomats' with ''nineteenth century values, '' and callcd for steps to strengthen the knowledge of science and technology within the Department of State and U.S. embassies abroad. [43]

CIP status within the Department has been further diminished because only USTR is empowered to negotiate telecommunications trade treaties and agreements,[44] and the FCC and NT I A largely determine the position of the United States with regard to spectrum

[43] Carnegie Commission on Science, Technology, and Government, Science *and* Technology *in U.S. International ,4/fairs: a Report (New* York: The Commission on Science, Technology, and Government, 1992),

[44] Cl P does have responsibility for negotiating some bilateral agreements, on International value-added networks, called IVAN agreements; it also has responsibilit y for coordinating some multilateral nontrade agreements, such as frequency allocations (World Adm inistrative Radio Conference).

allocation issues .45 This effectively deprives CIP of several vital functions with regard to international telecommunications policy.

There are several structural options for improving this situation; the broad alternatives are:

1. to strengthen and enhance the capabilities of CIP as a policy coordination mechanism, or
2. to abolish CIP and create an effective policy coordination mechanism elsewhere, possibly in the Executive Office of the President or in NTIA.

The State Department is (in the summer of 1993) about to adopt a third option—that of downgrading CIP, now a Bureau headed by the Coordinator, and placing its functions within the Department's Bureau of Economics, Business, and Agriculture. Telecommunications responsibility would no longer be vested in an assistant secretary but in a deputy assistant secretary, one of five within the bureau, This would require legislative ratification, since the post of Coordinator, with ambassadorial status, is statutorally established.

This appears to be the least desirable of the three broad options. Reorganization of this kind is unlikely to enhance CIP's ability to coordinate or provide policy leadership. It would instead further diminish CIP's ability to coordinate or negotiate with the other agencies, already nearly non-existent because CIP is a small bureau attempting to "coordinate" large agencies. It would be perceived abroad as a downgrading of the importance of telecommunications policy and would lessen the authority of CIP in international fora where foreign government representatives are highly sensitive to status. It could weaken the oversight of several congressional committees in telecommunications policy. It would leave open the option of creating a real, effective coordination mechanism somewhere else, such as in the Executive Office, but even this could be confused by the continuing existence in the Department of State of the legislatively mandated position of Telecommunications Coordinator with Ambassadorial rank.

One possible option for achieving better coordination of telecommunications policy formulation is to abolish CIP and shift its functions to some other part of the Federal structure. Old line State Department officials would probably be unlikely to object to this, since CIP is not embedded in the Department's power structure and is said to be regarded as something of an anomo]y within the Department. This option would however presumably require Congressional action, because the position of U.S. Coordinator is set by legislation. It would be resisted by the industry groups on whom CIP relies for making up or supporting its delegations to international meetings, since it could deprive them of entree into some negotiating fora. A greater objection to abolishing CIP and transferring its mandated role as coordinating mechanism is that this would probably remove international telecommunications policy formulation and implementation from oversight by congressional committees responsible for foreign affairs and trade.

It would also leave open the question of the appropriate locus for the necessary coor-

45 U.S. Congress, Office of Technology Assessment, *The* 1992 *World Administrative Radio Conference: Technology and Policy Implications,* OTA-TCT-549 (Washington, DC: U.S. Government Printing Office, May 1993).

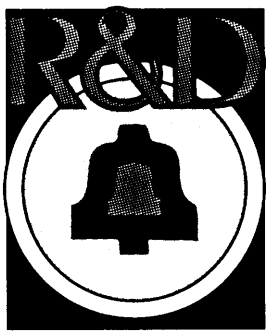
dination between NTIA and the FCC or among the several other government agencies that will from time to time have strong positions on teleccommunications issues. The obvious place for such coordination to occur, provided the new Administration places high priority on telecommunications issues, is within the Executive Office, possibly within the National Economic Council or in the Office of the Vice President, who has taken the lead in discussions about the future telecommunications infrastructure. The Office of Telecommunications Policy (OTP), which existed in the Executive Office of the President from 1970 until 1978, could be reconstituted. This opt ion, however, cannot be effective unless it is initiated and fully supported by the President.

Alternatively, CIP itself might be strengthened and reinvested with its original mission of active policy development and coordination. This suggests that international telecommunications policy would be recognized as an important part of domestic telecommunications policy and distinct from, yet closely related to, general trade policy. To reinvigorate CIP would likely require decisive reorganization, restaffing, and refunding. CIP would need a still small but highly qualified staff with knowledge of advanced communications and computer technology and of political, economic, and regulatory conditions affecting the telecommunications industry here and globally. It would also be possible to mandate a larger, perhaps coequal, role for CIP in telecommunications trade issues that now fall entirely to USTR. This would improve CIP's relative power status with its parent Department, and to some extent with the other executive agencies. However, in the interest of CIP's primary role of coordination, care would have to be taken that its role not be limited solely to international or trade issues.

Improving ClP's position within the State Department could be done only with the full support of, and ideally at the initiative of. the Department's top-level administrators and decisionmakers. Improving CIP's ability to act as a leader and as a mediator of other agencies on telecommunications issues would require the political attention and nurturing of executive and congressional leadership.

International Investment and Domestic Infrastructure

CHAPTER 9



Some analysts believe that there is a decline in U.S. infrastructure quality relative to that in other advanced nations.

A MAJOR PUBLIC POLICY DEBATE is shaping up over the modernization of the U.S. telecommunications infrastructure. The debate is framed primarily in terms of domestic technology policy. but is closely linked to the subject of international teleconmmnications and trade in services. The linkage is in two prevalent assertions:

- A highly advanced domestic communications infrastructure may be necessary to sustain long-term competitiveness in world markets, but
- excessive investment overseas by U.S. telecommunications firms could lead to ''disinvestment' in domestic communications networks, or in research and development (R&D).

The latter concern has been expressed by some State regulators, public interest group representatives, and independent analysts, who say the drain of capital from local and regional operating companies for investment in overseas ventures is causing a decline in telephone industry investment in domestic networks. Some believe there is already a decline in infrastructure quality compared with that in other advanced nations.

The objection to overseas expansion is not to international trade in services, which is almost invariably seen in positive terms, but to the preponderance of overseas direct investment through subsidiaries and joint ventures. These investments by carriers are sometimes assumed to compete for capital and for management attention with domestic infrastructure modernization.

On the other side, some state regulators and consumer group representatives object to proposed large investments in modernizing public networks, on the grounds that residential and small business subscribers will find themselves paying for capabilities and services that benefit only large corporations.

The term 'telecommunications infrastructure' has become popular to denote the facilities, networks, and equipment used to deliver telecommunications services; it is often extended to include organizations and people. The term acknowledges that telecommunications is not merely a set of tradeable services but also a basic part of the structure of industrial societies that is essential to social cohesion, governance, economic viability and equity. Even in purely economic terms, many people hold that "investments made in an advanced telecommunications infrastructure are justified on the basis of benefits that are realized at the macroeconomics level, over and above any direct benefits to individual enterprises. ' On the other hand, critics have warned that the use of the term, especially by U.S. carriers, is sometimes ''self-serving and instrumental because it is intended to suggest that the networks are imbued with the public interest and, thereby, merit direct public investment and regulatory relief.[2]

Within the scope of this report on U.S. telecommunications firms in European markets, there is no room to address the complex arguments and counterarguments about how

[1] Bruce L. Egan and Steven S. Wildman, "Investing in the Telecommunications Infrastructure: Economics and Policy Considerations," Institute for Information Studies, Annual Review, *A National /r? formation Network-Changing Our Lives in the 21st Century, 1992,* p. 29.

[2] Oscar H. Gandy, Jr., "Infrastructure: A Chaotic Disturbance in the Policy Discourse," Institute for Information Studies, op. cit., footnote 1, pp. ix ff.

much domestic infrastructure modernization should occur and who should pay for it, or whether the United States should construct a "National Information Infrastructure' or "electronic superhighway, ' This chapter will, however, address the narrower question that directly relates international trade in telecommunications services to this domestic telecommunications policy issue:

> *Is there evidence that growing overseas investment by regulated U.S. telecommunications operators is resulting in a significant decline in domestic investment, either in modernizing of physical facilities or in research and development?*

International comparisons

Two kinds of investment must be considered: investment in infrastructure modernization, and longer-term industry investment in R&D. According to many researchers on innovation and competitiveness:

> *Facilities for basic research. . . can be considered as an increasingly important part of the infrastructure for downstream technological and production activities.*[3]

Infrastructure modernization

The superiority of the U.S. network was generally accepted for decades, but is now being questioned. Some analysts claim the Nation's telecommunications infrastructure is, if not deteriorating, at least no longer clearly the world's best. Robert G. Harris of the University of California at Berkeley, William Davidson of the Management Education Services Association, and Kenneth Robinson, former assistant to Chairman Alfred Sikes of the Federal Communications Commission (FCC), are among those who believe that the quality of the U.S. telecommunications infrastructure is slipping and could fall behind that in Europe.[4] Harris says:

> *[B]y the late* 1980's *the United States no longer [had] a telecommunications sector far superior to that of other nations, in the quality or extent of the network, in the range of communications or information services available through the network, or even in the underlying technological prowess.*[5]

Others suggest that the United States has already been surpassed.[6] These charges were made so frequently and strongly that the

[3] K. Pavitt, "What Makes Basic Research Economically Useful?" *Research Policy* 20, *1992,* p. 109.

[4] Robert G. Harris is Chairperson of the Business & Public Policy Group of the Walter A. Haas School of Business, University of California, Berkeley; William Davidson is a professor at the University of Southern California and President of the Management Education Services Association (MESA), a consulting group often used by RBOCs; see MESA, *Comparative Assessment of National Public Telecommunications Infrastructures*, April 1990.

[5] Robert G. Harris, "Telecommunications Services as a Strategic Industry: Implications for U.S. Public Policy," Michael A. Crew (cd.), Competition *and the Regulation 01 Utilities* (Norwell, MA: Kluwer Academic Publishers, 1991).

[6] For example, Shlomo Maital argues that "the French phone system may now be the world's best." Shlomo Maital, "The Global Telecommunications Pict ure: Is America Being Outstripped by France?" *The Brookings Review*, summer 1992, p. 41.

National Telecommunications and Information Administration (NTIA) in 1991 undertook a detailed assessment of the evidence for infrastructure deterioration.' While the study was underway, a series of service outages occurred in the summer of 1991 that involved failures of software switching and signaling; these raised further suspicions about the quality of the network.

The NTIA report concluded that the United States still holds a high ranking in international comparisons of telecommunications infrastructure. By NTIA assessment, the United States was in 1991 first in network utilization, first in network reliability, and first in fiber optics deployment and common channel signaling. It was seventh in number of lines per 100 persons, but it was exceeded only by the Nordic countries, Switzerland, Canada, and Iceland, all of which for reasons of geography, climatic, and population dispersion put especially great emphasis on access to telephone lines. The United States is far down the list in Integrated Services Digital Network (ISDN) capability, but ISDN is not necessarily a good indicator of modernization. The lower rate of ISDN deployment in United States reflects a trend toward a different philosophy of network architecture, oriented toward dispersed intelligence or computerization rather than centralization and integration (see chapter 2).

In international comparisons, the United States ranked 13th in average annual industry investment per main line during the 1980s, according to NTIA, falling behind the major European countries except for the United Kingdom.[8] However, when the expenditures were partitioned into two categories, ''expansion' and ''modernization, ' the United States ranked higher on industry investment in modernization.[9]

The NTIA report concluded that ". . .thc United States is a nation with an advanced telecommunications infrastructure, a very high access-line density, a robust level of telephone usage, and a heavy emphasis on modernization. [10] It noted, however, that ''other countries may be planning to deploy several new technologies, such as digital switching and Signaling System 7 (SS7), more rapidly than companies in the United States.' NTIA then advocated increased competition in local exchange markets and the elimination of government-imposed barriers to competition such as those in the Modified Final Judgment (MFJ) and cross-ownership provision of the cable-telephone company. (See chapter 1, box 1 -A,)

There was, according to William F. Maher, the NTIA Associate Administrator responsible for the report, ''a political bias toward a competitive solution' to the infrastructure issue in the NTIA report. In a statement

There may have been a "political bias toward the competitive solution" to infrastructure issues.

[7] U.S. Department of Commerce, National Telecommunications and Information Administration: *The NT/A /infrastructure Report: Telecommunications in the Age of Information*, October 1991.

[8] NTIA, op. cit., footnote 7, pp. 153 ff.

[9] NTIA used several measures for investment in modernization, making adjustments for factors such as accounting treatment for labor costs and varying patterns of responsibility for consumer premises equipment. In t he several resulting analyses, the United States ranked from first to sixth, either ahead of or close to the major European countries.

[10] NTIA, op. cit., footnote 7, Executive Summary, pp. i-ii.

provided to OTA by Maher in 1992,[11] he acknowledged that prior to its release, the NTIA study was thoroughly examined to ensure that it was fully congruent with prevailing deregulatory policy. Thus the report recommendations and international comparisons should be accepted with at least a grain of salt.

Maher said that the NTIA data, although ''limited,"

> *. . . appeared to contain indications that a straight competitive market approach may not be the most efffective way to develop a superior telecommunications infrastructrure, e.g. . . . The U. S., the world's most competitive country, is being eclipsed in key areas of technology (e.g.,* SS7 *and digital switching) by countries that have retained a single supplier telecommunications environment (e.g., France). . . ."*

The NTIA infrastructure report itself cautions that other countries are rapidly catching up, especially those countries in which investments for network modernization are supported by government policy. The United Kingdom, France, Japan, and Singapore have all made telecommunications modernization a high priority,

Most international comparisons look only at investments by the public telephone operators (PTOs) for public networks, but in the United States, more than in any other country, there is also much corporate investment in private network technology. Moreover, the figures for the United States exclude customer premises equipment, while those for foreign countries arc likely to include functionally-comparable equipment belonging to the PTOs. The FCC says that annual infrastructure investment in the United States totals more that $50 billion, which is split almost evenly between network equipment and customer premises equipment. [12]

Thus, while it is widely accepted that investment by U.S. carriers in physical infrastructure is lower than such investment by many foreign PTOs, both as a percentage of revenues and a percentage of net profits, it is difficult to determine how large the gap really is, what causes it, and whether all or any part of it is related to overseas investment.

***It** is **difficult to tell how large the gap** in investment is, or what causes it.*

*International **R&D** expenditures*

Successful competition in international telecommunications markets may in the long run depend on continuing investment in R&D:

> Where *innovation is an important aspect of competition, the ability of a firm to survive depends on the effectiveness of its research and development laboratories [and] on its ability to exploit its innovations and protect them, or to quickly match anything its competitors may do.*[13]

[11] Maher made these statements personally in an informal meeting at George Washington University, and himself distributed the typed version, which does not however bear his name but that of J.C. Barry, Regulatory Research, and the date Nov. 12, 1991.

[12] Statement of Robert Pepper, Chief, Office of Plans and Policy, FCC, in Hearings on National "Technology Policy, before the Subcommittee on Technology, Environment, and Aviation of the House Committee on Science, Space, and Technology, Mar. 23, 1993.

13 Richard Nelson, *Understanding Technical Change as an Evolutionary Process (New* York: Elsevier Science Publishers, 1987), p. 6.

Table 9-1. R&D Expenditure Comparison: Bell Operating Companies vs. Domestic and Foreign Equipment Vendors, Fiscal Years 1985-90

R&D expenditures ($millions)

Company	1985	1986	1987	1988	1989	1990	6 yr. total	6 yr. avg.
BOC composite	s 91	**$ 112**	$ 126	$ 306	$ 325	$ 319	$ 1,279	$ 213
Alcatel	**200**	**237**	316	330	297	386	1,766	294
AT&T	2,228	**2,278**	2,453	2,572	2,652	2,433	14,616	2,436
Ericsson	314	**424**	507	601	673	803	3,322	554
Fujitsu	530	**884**	1,141	1,529	1,862	1,891	7,837	1,306
NEC	1,146	**1,841**	2,634	3,482	3,665	3,496	16,264	2,711
Northern Telecom	430	**475**	588	711	730	774	3,708	618
Siemens	1,561	**2,303**	3,443	3,913	3,629	4,123	18,972	3,162

R&D expenditures as a percentage of revenue

Company	1985	1986	1987	1988	1989	1990	6 yr. avg
BOC composite	0.1 %	0.2%	0,2%	0.4%	**0.4%**	0.4%	0.3%
Alcatel	16.7	16,0	18,4	19.5	**20.2**	22.9	18.3
AT&T	6.5	6.7	7,3	7.3	**7.3**	6.5	6.9
Ericsson	8.6	9.9	9.9	11.3	**11.0**	10.7	10.4
Fujitsu	8.5	9.3	9.3	9.3	**10,3**	11.7	10.0
NEC	12.7	14.0	15.7	15.9	**15.8**	16.1	15.4
Northern Telecom	10.0	10,7	12.0	13.1	**12.0**	11.4	11.6
Siemens	8.8	11.5	12.1	10.9	**11.2**	11.0	11.0

SOURCE ROBERT G HARRIS, "RESEARCH AND DEVELOPMENT EXPENDITURES BY THE BELL OPERATING COMPANIES A COMPARATIVE ASSESSMENT," 23RD ANNUAL CONFERENCE, INSTITUTE OF PUBLIC UTILITIES, MICHIGAN STATE UNIVERSITY, DEC. 9, 1991

Investment in R&D by telecomnmunications companies is said by many experts (even within the industry) to be lower in the United States than in Europe and Japan, both for equipment manufacturers and for services companies. (See table 9-1.)[14] AT&T's annual expenditures for R&D from 1985 through 1990 averaged about 6.9 percent of revenues: those for European equipment manufacturers were all higher, ranging from 10 to 18 percent. However, AT&T is a carrier as well as an equipment manufacturer, a factor that would be expected to dilute its R&D expenditure relative to purely technology-development firms.

Other analysts have compared the R&D expenditures of the three largest U.S. firms manufacturing telecommunications equipment (AT&T, GTE, and Rockwell) with that of the five largest European manufacturers for the years 1985 through 1990. U.S. spending on R&D increased about 2 percent in these years (i.e., was essentially flat), while the Europeans' R&D investments

[14] Robert G. Harris, "R&D Expenditures by the Bell Operating Companies: A Comparative Assessment," paper presented to the 23rd Annual Conference of the Institute of Public Utilities of the Michigan State University, in Williamsburg, VA, Dec. 9, 1991. Professor Harris' data were gathered in an audit performed on behalf of the National Association of Regulatory Utility Comm issioners.

Table 9-2. R&D Expenditure **Comparison: Bell** *Operating Companies vs. Foreign Telecommunications Companies, Fiscal Years 1985-90*

R&D expenditures ($millions)

Company	1985	1986	1987	1988	1989	1990	6 yr. total	6 yr. avg.
BOC composite	$91	$112	$ 126	$ 306	$ 325	$ 319	$1,279	$ 213
British Telecom	226	239	305	368	361	376	1,875	313
France Telecom	298	431	449	730	595	723	3,226	538
NTT	507	767	1,024	1,461	1,672	1,568	6,999	1,167

R&D expenditures as a percentage of revenue

Company	1985	1986	1987	1988	1989	1990	6 yr. total
BOC composite	0.1 %	0.2%	0.2%	0.5%	0.4%	0.4%	0.3%
British Telecom	2.4	1.9	2,0	1.9	1.9	1.9	2.0
France Telecom	3.3	3.4	2.8	4.6	3.5 [4]	4.0	3.6
NTT	2.7	2.7	2.8	3.2	3.8	4.1	3.3

SOURCE ROBERT G HARRIS, "RESEARCH AND DEVELOPMENT EXPENDITURES BY THE BELL OPERATING COMPANIES A COMPARATIVE ASSESSMENT," 23RD ANNUAL CONFERENCE, INSTITUTE OF PUBLIC UTILITIES, MICHIGAN STATE UNIVERSITY, DEC. 9, 1991

increased by 17 percent.'[15] The annual average number of U.S. patents granted to the U.S. companies decreased by 3.2 percent during this period, while the number granted to the European companies rose by 11 percent. overseas expansion by U.S. carriers began growing significantly during this period (about 1987-88), but the period also saw a serious recession begin.

Table 9-1 includes for comparison the R&D investments of the Bell operating companies (BOCs), which are only 0.3 percent of revenue annually. This is again a misleading comparison because the BOCs are precluded from equipment manufacturing, which is generally more research-intensive than services. Nevertheless, investment in R&D is very likely depressed by the regulatory separation of manufacturing and services.1'

Table 9-2 compares R&D expenditures by the regional Bell holding companies (RBHCs) (including support for their shared research facility, Bellcore) with expenditures by BT and France Telecom, a more suitable comparison because those firms are also carriers that do not manufacture equipment and serve populations and geographical areas comparable to those of some RBHCs. The expenditures for R&D, as percentage of income, are respectively 7 to 12 times greater for the European PTOs than for the RBHCs. Here also there are caveats. In Europe the trend is toward building intelligence into the network, whereas in the United States the trend is toward placing intelligence at the periphery of networks, including more of it in advanced terminal or customer-premise equipment. This affects where investment in R&D occurs and by whom it is made.

15 Robert T. Blau, "IS Technology the Key to Competing in Global Telecommunications Markets?" *Technology in Transition,* 1993 BellSouth Environmental Scan, pp. 44-51. R&D expenditures by Japan's NTT increased 19 percent in the same period, and its number of U.S. patents grew by 11 percent.

16 Robert G. Harris, op. cit., footnote 5.

Table 9-3. R&D Expenditure on Telecommunications in Selected Countries, 1987 ($ billions)

	U.S.	Japan	Germany	France	U.K.	Italy	Sweden	South Korea	Netherlands	Spain
R&D expenditure on telecommunications	13	4.7	2.5	2.1	2.1	0.5	0.48	0.41	0.2	0.11
Military sector	5	0	0.2a	1.0	0.7	na	O.1	[a] na	O[a]	na
Civil sector	8	4.7	2.3	1.1	1.4	na	0.38	na	**0.2**	**na**
R&D expenditure on telecommunications as percentage of total national R&D expenditure	10	10	11	13	13	6	14	9	5	5

NOTES Estimates Conversion factor of national currencies with purchasing power parity in U S dollars

[a] Approximation.

SOURCE HARIOLF GRUPP AND THOMAS SCHNORING, "RESEARCH AND DEVELOPMENT IN TELECOMMUNICATIONS NATIONAL SYSTEMS UNDER PRESSURE," *TELECOMMUNICATIONS POLICY*, JANUARY/FEBRUARY 1991, PP 46-65.

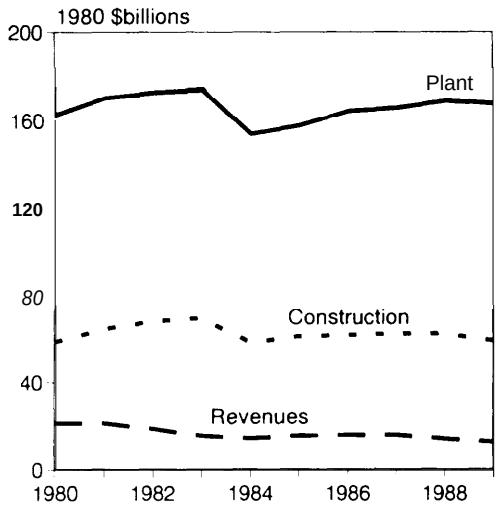
According to this reasoning, European expenditures attributed to industry research on telecommunications equipment probably include much research that in the United States is conducted by computer manufacturers.

Since the PTOs are largely state-owned, they may be a channel for national R&D support that in the United States would be directed at military research or at the national laboratories. Hariolf Grupp and Thomas Schnoring, German researchers, compared 10 countries in terms of R&D expenditures on telecommunications in 1987, and concluded that levels of spending reflected the size of national economies (see table 9-3.) They ranked the United States first ($13 bill ion), followed by Japan ($4.7 billion) and the four large European countries (Germany, $2.5 billion; France, $2.1 billion; the United Kingdom, $2.1 billion: and Italy, $0.5 billion). The conclusions of Grupp and Schnoring are thus at odds with most other analysts, probably because they include all sources of R&D funding, including military spending.[17] Nearly all nonmilitary R&D spending in the United States comes from the carriers, the German analysts claim, compared with about 60 percent in France and only 7 percent in Germany. In the United States, much government funding of R&D has been carried out through the Department of Defense,[18] while in other countries it may come from nonmilitary agencies; so this comparison may reflect national differences in public administration rather than differences in government/industry research funding,

[17] Military R&Don telecommunications, according to Gruppand Schnoring, has significant spillover benefits for civilian telecommunications. Hariolf Grupp and Thomas Schnoring, "Research and Development in Telecommunications: National Systems Under Pressure," *Telecommunications Policy,* January/February 1991, pp. 46-65. See also Thomas Schnoring, "European Telecommunications R&D Systems m Transition," Wissenschaftliches Institut fur Kommunikationsdienste GmbH, Bad Honnef, Germany, December 1992.

[18] Federal Government funding supports nearly half of the communications R&D performed by Industry, according to the National Science Foundation, *National Patterns 01 R&D Resources: 1992*, NSF 92-220, October 1992, table 3, p. 19.

Figure 9-1. Local Telecommunications Exchange Carrier Plant and Revenues, 1980-89



SOURCE: U.S. TELEPHONE ASSOCIATION.

Most of the available international comparisons are highly questionable on several grounds, including differences in industry structure, regulatory requirements, and accounting procedures. What is included in "R&D expenditures" and the meaning of "net income' may differ.

The question of domestic disinvestment

Assuming that investment by U.S. telecommunications firms in physical modernization and in R&D is below that in Europe, this still does not address the narrower questions of whether it is declining, and specifically whether it declined after overseas expansion became common and as a result of the increasing overseas investment.

Trends in infrastructure modernization

According to the U.S. Telephone Association, the value of U.S. carriers' current plant grew only 3 percent from 1980 to 1989 (in constant 1980 dollars), and the value of annual construction appears to have decreased strikingly between 1980 and 1989. (See figure 9-1.) In 1980 dollars, it decreased 40 percent from 1980 ($21.2 billion) to 1989 ($12.6 billion). In 8 of the 9 years, construction declined from the previous year or was stable (increasing 1 percent or less).

FCC figures for 'reporting local carriers indicate that from 1985 to 1989, the value of gross plant grew by 6 percent (in constant dollars) but it did not increase from 1987 to 1989.[19] (See figure 9-2.) Each year from 1986 through 1989, the value of annual construction declined from 2 to 10 percent over the preceding year, from $15, 1 billion in 1985 to $12.3 billion in 1989, in 1980 dollars. (Annual revenues also declined by 3 percent in constant dollars in the same period.) Construction increased slightly in 1990 and 1991, as did revenues. During the 4 years 1988-91 (the only years for which data is available), the value of gross plant for the seven RBOCs declined just over 3 percent in constant dollars; the value of annual construction was steady.[20] These figures include both expansion and modernization expenditures.

Interpreting these trends is complicated, however, by the fact that the cost of computer and telecommunications equipment (e.g., fiber optics) was decreasing during

[19] FCC figures are for reporting carriers only, i.e., all regulated local exchange carriers. In 1984 RBHCs/RBOCs were separated from AT&T, and those figures may not be comparable to later figures.

20 FCC *Statistics of Common Carriers*, 1988-89, *1989-90, 1990-91, 1991-92,* table 2-7, each volume.

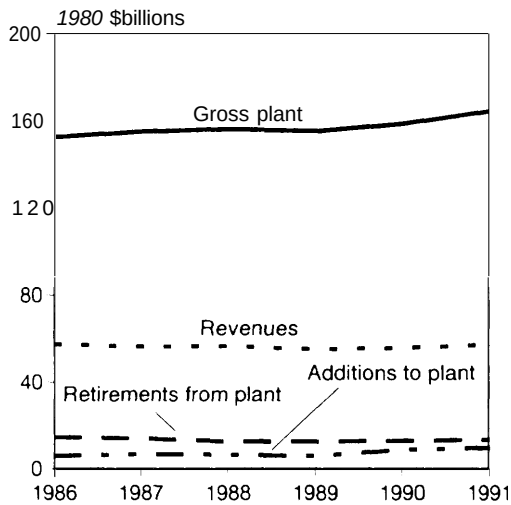
these years, The way in which several factors--cost trends, divestiture and separation of equipment and services provision, and overseas investment—interacted rides conclusions on the basis of this evidence questionable. A decade or less, in which there were several major disruptions, does not provide reliable trend data. Further, the numbers are themselves suspect because of several industrywide changes in accounting procedures promulgated by the Financial Accounting Standards Board.[21]

Trends in research and development

Expenditures for research, development, and engineering are also a long-range investment in infrastructure modernization. As noted by political scientist John Zysman:

> *. . . [C]ertain industries may be more important than others because they generate benefits for the rest of the economy, and government policies to promote or protect them can improve welfare by fostering these spillover effects. High-technologogy industries are likely to generate positive externalities because of the knowledge generated by their research and development activities, and because the benefits of this know'ledge cannot be completely appropriated by the private agents who pay the costs for the generation of such knowledge.* [22]

Telecommunications is among the industries that have generated positive social externalities from R&D; it can be shown that advances in telecommunications systems and services have benefited most sectors of American life and society, have been essential to national security, and have supported the rise of major industries. Professor of business Robert C. Harris says that R&D expenditures in leading-edge technologies such as telecommunications equipment and services generate tremendous positive spillovers that accrue to those who use and those who supply the product or process innovations that flow from R& D."[23] But the recent status and future prospects for telecommunications R&D is obscured, for public poli-



SOURCE: FEDERAL COMMUNICATIONS COMMISSION.

Figure 9-2. Local Telecommunications Exchange Carrier Gross Plant and Revenues, 1984-91

2 The Financial Accounting Standards Board (FASB) is a nongovernmental entity authorized by the U.S. Securities and Exchanges Commission to set financial accounting and reporting standards for business organizations for which stocks are publicly traded. It made changes in accounting procedures for telecommunications carriers m 1982, 1986, 1987, and 1989 (FASB Statements 71, 86, 87, 89). This Introduces discontinuities in time-series data. Information courtesy of Mark Card In, FASB.

22 John Zysman, "Trade, Technology, and National Competition," *International Journal of Technology Management,* vol. 7, No. 1-3, 1992, p. 169.

23 Robert G. Harris, op. cit., footnote 14, p. 2.

cymakers, by a dearth of reliable data. As pointed out in chapter 8, divestiture and deregulation together with longstanding government policy toward industry data collection have resulted in deficiencies in the information available to policy makers.

The Bureau of the Census conducts an annual Survey of Industrial Research and Development on behalf of the National Science Foundation (NSF) .24 Individual corporate responses are protected by law and only highly aggregated data are available to policy makers and the public; the way categories are defined makes it impossible to get a comprehensive value that includes all telecommunications R&D,[25] Telephone operating companies with revenues over $100 million must report research expenditures annually to the FCC; but this data is available only since 1988, and it covers only regulated common carriers, including the RBOCs.[26] The research performed or funded by the parent RBHCs on nonregulatcd services and technologies (such as cellular communications), including RBHCs' support for Bellcore, is not reported. Financial statements that the RHOCs make to the Securities and Exchanges Commission (Form I Ok) unanimously list R&D expenditures as "N.A." (nonavailable).

Attempts to identify trend lines in research expenditures by major carriers are further confused by the lack of consistent time-series data resulting from the many discontinuities: divestiture and reorganization, changes in accounting procedures, and acquisitions. *7 The implications of the observations reported below, therefore, contain significant uncertainties and can be considered as indicators only.

The NSF reports based on Bureau of Census data indicate that R&D performed by U.S. telecommunications equipment manufacturers, including AT&T, was 117 percent higher in 1985 than in 1980, but had increased only another 10 percent by 1990. For comparison, R&D performed by all manufacturers was only 89 percent higher in

24 A "controlled sample" of enterprises is designed to include all large companies known to be "major performers of R& D," according to analysts at the Bureau of the Census. A long detailed questionnaire is used in odd years and a shorter form in even years. See National Science Foundation, Surveys of Science Resources Series (latest edition, *Research and Development in Industry: 1989*, NSF 92-307), and *National Patterns of R&D Resources: 1992*, NSF-930, October 1992, which covers government and university R&D performance and expenditures as well as industry performance and expenditures.

25 The annual dollar value of R&D performed by telecommunicate ions equipment manufacturers is reported. This would include AT&T, since company identif icat ion is by standard industrial classif ication code. Closely related R&D on telecommunicate ions performed by computer manufacturers is in a different category that aggregates all computer R&D, and telecommunications services companies are lumped with construction, engineering, and all other services providers in the single category of "nonmanufacturing companies."

26 The data is published annually in the FCC's *Statistics of Common Carriers.* R&D expenditures were not reported prior to 1988, when a new FCC reporting rule was implemented, according to the FCC's Industry Analysis Division.

27 Research expenditures are not specifically reported to the Securities and Exchanges Commission by telecommunications companies, and the chief source of information about them are the companies' annual reports and "Form Ms" filed with the FCC. However, the FCC doubts such figures are fully comparable across companies. (Discussions wit h Industry Analysis Section, FCC). See chapter 8 for a discussion of t he inadequacy of data for policy analysis.

1985 than in 1980 but increased 24 percent from 1985 to 1990.

Information supplied by AT&T indicates that in constant dollars, AT&T's annual research expenditures (chiefly for Bell Labs) have fluctuated slightly from year to year, but essential y remained flat from divestiture in 1984 through 1991 (see table 9-4). They increased in constant dollars about 2 percent from 1987 through 1991, the period of overseas expansion. In 1992 there was a significant decrease in research expenditures, about 9 percent less than 1991 in constant dollars. AT&T's comptroller attributed this in part to a real decline and in part to a ' 'bookkeeping artifact" related to the NCR acquisition. Looked at as a percentage of reported operating revenues, research expenditures have been declining since 1990. The AT&T Annual Report says that this " . . .reflects streamlined efforts for telecommunications network products and systems and a consolidation of research and development efforts for computer products and systems following the merger [with NCR]. '

The new president of Bell Labs, John S. Mayo, promised in July 1990 that he would make the institution ''. . more of a profit-minded industrial laboratory. '[28] An AT&T spokesman said that the outlook for research expenditures is to remain flat, or shrink slightly, over the next few years.[29] This, the spokesman said, is a result of competitive pressure. Although AT&T remains "deeply committed to research, ' in recent years R&D expenditures have been subjected to more critical scrutiny within the company than they were in AT&T's years as a regulated monopoly, and are often ''hotly contested' by the company's business units.

The profile of R&D expenditure is also changing. Infrastructure modernization depends heavily on software. Bell Labs has 25,000 scientists and engineers, plus 5,000 administrators and support staff, located in 29 facilities in six states; of these, approximately 4,000 have doctorates.[30] Software development is now the dominant activity—there are now more computer scientists than electrical engineers at Bell Labs. In 1992,90 percent of the budget went to "developmerit," under the control of the managers of the 20 lines of business. This allocation between development and research does not appear to have changed a great deal since divestiture, but the physics and materials

Table 9-4. AT& T Research and Development Expenditures, 1978-92

($millions) Constant $: 1987=0

Year	R&D expenditures	Constant $	% Change	Total operating revenue	R&D as % of revenue
1984	$2,188	$2,404		$33,187	6.59
1985	2,228	2,360	-1.8	34,417	6.47
1986	2,278	2,373	0.6	34,087	6.68
1987	2,453	2,453	3.4	33,768	7.26
1988	2,572	2,475	0.5	35,210	7.30
1989	2,652	2,444	1.2	36,112	7.53
1990'b	2,935	2,593	6.0	62,191	4.72
1991	3,114	2,643	1.9	63,089	4.94
1992	2,911	2,414	-8.7	64,904	4.49

a The fluctuation 1990-91 Includes the effect of software capitalization, a change in accounting procedures.
b The large jump in total operating revenue results frm inclusion, after 1989, of access charges.
SOURCE OFFICE OF TECHNOLOGY ASSESSMENT R&D EXPENDITURES AND TOTAL OPERATING REVENUE FROM AT&T ANNUAL REPORTS TO STOCKHOLDERS, 197S-92.

[28] Peter Coy, "The Man Who's Running a Nutsier-Boltsier Bell Labs," *Business Week,* Aug. 5, 1991, p. 69.

29 OTA interview with Gale Jackson, AT&T Comptroller, Mar. 10, 1993.

30 Michael Maccoby, "Transforming R&D Services at Bell Labs," *Research & Technology Management,* January/February 1992, pp. 46-47.

science laboratories within the research division are being "de-emphasized."[31]

AT&T officials say they are putting strong emphasis on making the "development" component of R&D more cost-effective, by shortening the development cycle and getting new products to market faster, and therefore the number of people in "development' is shrinking. As a result, AT&T officials say, the basic research component of the R&D expenditure is probably rising relative to the development component. Critics dispute this, saying that there has been a pronounced shift from the long-range "near-basic" research for which the old Bell Labs had long been famous, to much more short-range market-oriented research. To the extent that this is true, it would more likely be an indirect effect of divestiture, deregulation, and increased market competition than an effect of alternative investment overseas.

Evidence of declining investment in infrastructure and R&D is mixed.. . but investment in both is almost surely less than needed.

Bell Communications Research, Inc., commonly known as '' Bellcore," was incorporated October 20, 1983, to provide its shareholders, the RBHCs, with technical support including research, engineering, and services related to emergency preparedness and national security. Bellcore does R&D in those technical areas where its owners, the RBOCs, are not in direct competition (i.e., basic communications services). Most of its research results are available to all of the owners, but occasionally there are "private' projects.[32] It also does research for some other telephone industry clients such as Bell Canada.

Bellcore's RBHC owners provide most of the institution's revenue, sharing the cost according to a formula based on the number of access lines owned by each company. Their expenditures ranged, in 1992, from $125.9 million for Pacific Bell upto$174.8 million for Bell Atlantic,[33] Other income comes from research or services done for independent telecommunications operating companies, government, or vendors, and from licensing sales. Together, these accounted for about 18 percent of total revenue in 1992.

Bellcore's budget from its inception through the current year has grown 4.9 percent in constant dollars. (See table 9-5.) It increased by 7.5 percent in real terms in the shorter period of the RBHCs' overseas expansion, from 1987 through 1992, after having shrunk through inflation. (It is possible that some of this growth is an artifact of changes in accounting practices that occurred at about this time.) However, the proportion of Bellcore's income provided by the RBHC owners also changed in that period; RBHCs contributions grew less than 2 percent from 1987 through 1992.

George Heilmeier, president of Bellcore, has said that his aim is faster product development. He has stepped up research in information technologies such as object-oriented computing and multimedia services, and is putting less emphasis on physical sciences. Bellcore ''will move away from the

31 Peter Coy, op. cit., footnote 27, and William Sweet, "Bell Labs Reorganizes Research for More Competitive Environment," *Physics Today*, June 1991, pp. 97-102.

32 Gary H. Anthes, "Bellcore in Search of New Ideas," *Computerworld*, Feb. 25, 1991, p. 83. For example, U.S. West persuaded Bellcore to keep a project proprietary for 2 years.

33 Bellcore, 1992 Annual Report.

academic model..."[34] and its operating budget may continue to shrink over the next few years.

Several of the RBHCs also have their own R&D units, apart from Bellcore, in order to protect the proprietary nature of the R&D. The most elaborate of these is NYNEX's Science & Technology, lnc.,[35] which has 346 employees in four laboratory facilities and does research in areas such as expert systems, speech reccognition and synthesis, and wireless technology. U.S. West has a somewhat smaller Advanced Technology Group, and Southwestcm Bell also has an internal R&D staff. The R&D expenditures for- these organizations are not made public.

Year	Revenue	Deflated revenue[a]	Change	%Revenue from owners	Employees	Change
984	848,357	931,748		86	n/a	
985	864,626	916,208	-1.7	91	n/a	
986	873,930	901,702	-1.2	93	n/a	
987	909,902	909,902	0.9	93	7,652	
988	984,330	947,838	4.2	92	8,237	-7.6
989	,043,537	962,495	1.5	92	8,124	-1.4
990	,097,198	972,090	1.0	91	8,635	+6.3
991	,139,042	972,709	0.1	90	8,239	-4.6
1992	$1,180,636	$977,752	0,5%	880/0	7,208	-1 2.50/o

Real change, 1984-1992 = +4.9% real change in owners' contribution = +17.9%
Real change, 1987-1992 = +7,5% real change in owners' contribution = +1.7%

a 1987 dollars

SOURCE BE LLCORE ANNUAL REPORTS, 1984 TO 1992

Tab/e 9-5. Be//core Revenue and Employees, 1984-92

Determinants of infrastructure investment

The evidence of declining telephone industry investment, in infrastructure or in R&D, is mixed and indeterminate, but the clues are sufficient to assume that U.S. industry investment in both is almost surely less than that needed to assume the United States of continued leadership, and there are no signs that it is rising There is, at a minimum, logical justification for raising two questions:

- Will investment in infrastructure moderization decline, at least in the short term. through competition with investment opportunities overseas?
- Has R&D spending declined because of the change from a monopoly market, with protected rates of return, to highly competitive markets where the investment horizon is shorter'?

On the other hand, there are good reasons to argue that competition in domestic markets and in thc global marketplace is necessary to maintain high rates of innovation in high-tech companies.

Those who perceivec a decline in domestic investment and blame it on the rush of telecommunications carriers to take advantage of overseas investment opportunities- argue that more rapidly expanding markets in Europe offer the opportunity for highcr returns and more immediate payoff than does modernization of the domestic infrastructure. Domestic investments also may suffer, they suggest, because they must meet the inspection and challenge of state regulators. Since companies must allocatc resources among competing interests, a pool of

[34] Heilmeier, quoted in Emily Smith and Peter Coy, "Pumping up the Baby Bells' R&D Arm," *Business Week,* Aug. 5, 1991, pp. 68-70.

35 NYNEX Science & Technology began m 1985 but was Incorporated as a wholly-owned subsidiary in August 1991. It has laboratories in White Plains, NY; New York City; and Cambridge and Framington, Massachusetts.

investment capital (such as the RBHCs' retained earnings) is likely to be invested disproportionately in enterprises located in economically more favorable environments.

Since local telephone services are growing slowly, RBHCs are looking to expand their portfolios of revenue-producing services, particularly video programming. However, as monopoly providers of local telephone service, they currently face a number of constraints on the services they arc permitted to offer. and these restrictions are cited as significant disincentives for network investment.

The 1992 Economic Report of the President asserted:

> *. . . it may be regulation that is discouraging firms from investing in new infrastructure. When regulatory barriers are removed, competition and the ability of firms to reap the rewards of their success provide sufficient incen - tives to invest in commercially viable telecommunications technologies. There are firms, however, that are reluctant to invest because they cannot be assured of fully capturing all the benefits of their investments.*[36]

The most frequently cited impediment is the Modified Final Judgment,[37] which prevents the RBOCs from manufacturing telecommunications equipment and offering long-distance service, and until recently from offering information services (see chapter 4, box 4-A).[38] RBHCs claim these restrictions constitute significant disincentives for continued robust investment in the public-switched network. The removal of the MFJ restrictions, they promise, will result in new industry investments in the network—justified by their entry into promising new markets. This has been interpreted by some people to mean that they would increase domestic investments at the expense of investments overseas. That would not be necessary (telecommunications companies have very high ratings in capital markets). Nor would it be likely, given the growth opportunities projected for overseas markets (see chapters 3 and 4).

A U.S. investment analyst, assessing the risk that overseas expansion will create a capital drain on U.S. telephone operators, concludes that:

> *In most cases, this risk is minimal and has not been sufficient to warrant consideration of lower ratings for the*

[36] The Economic Report of the President, Transmitted to Congress January 1993, p. 179.

37 After the divestiture of AT&T in 1982, RBOCs were granted the exclusive franchise for local telephone service, which was widely regarded as a natural monopoly, and were kept out of lines of business deemed competitive. Fears of cross-subsidizing competitive or nonregulated markets (equipment manufacturing, long-distance service) with revenue from noncompetitive or regulated markets (i.e., local telephony) informed this policy choice.

3.The manufacturing ban continues to prevent RBOCs from making changes to the software in their switches. The prohibition on long-distance carriage prevents RBOCs from centralizing information services on a single gateway for their entire regions and instead requires that they install database and switching equipment in each local access and t ransport area (LATA). National Telecommunications and Informat ion Administration, *The NTIA Infrastructure Report: Telecommunications in the Age of Information*, U.S. Department of Commerce, October 1991, p.215. NTIA has advocated the removal of the line-of-business restrictions contained in the MFJ and the cross-ownership prohibitions on cable-telephone company accepting the BOCs' promise of deployment of new services and technology.

U.S. telephone subsidiaries. Moreover, U.S. regulatory agencies would take a dim view of any attempt to seriously weaken the financial health of the local telephone companies.[39]

In addition to the MFJ, the local telephone companies arc confronted with a tangle of other federal and state regulatory obligations. The domestic investment plans of the telephone companies are subject to the review of state public utility commissions (PUCs), whose priorities for telecommunications delelopment may differ from state to state even within an RBOC's service area. Regulators have conflicting priorities: in the absence of a competitive market environment, regulators arc responsible for curbing imprudent investments and possible overinvestment that would burden customers with unnecessary costs, and at the same time, they must assure a sufficient level of industry investment to prevent telephone service from degrading and to assure that it continues to develop and improve.

Under traditional rate-of-return regulation (the prevailing regulatory model for several decades), the carriers had an incentive to invest in facilities; some critics said it was an incentive to overinvest. After divestiture and the end of cross-subsidization of local residential rates by business and long-distance rates, regulators sought to stabilize consumer prices. Beginning in the late 1980s, more than half of the states adopted some form of "incentive regulation. " This is a modified form of rate-of-return regulation, under which the regulators set a base rate of return; earnings above that rate are allowed but must be shared between ratepayers and shareholders.[40] Regulators retain control over the price of basic residential and small business access, but give the carrier pricing flexibility on competitive services offered to large companies. The carrier has an incentive to reduce costs and thus increase earnings. [41]

Critics say that incentive regulation encourages short-term cost reduction rather than long-term investment.

Incentive regulation encourages short-term cost reductions rather than long-term investment in infrastructure and in R&D,

39 Fitch Investors Service, Inc., "U.S. Telephone Companies Seek Fortunes Overseas," 1993.

40 Joseph S. Kraemer, "Improving LEC In cent ive Regulation Plans," *Public Utilities Fortnight/y,* Feb. 1,1991.

4 The local exchange carriers are also com ing under competitive pressure to cut costs. The alternative carriers, such as Metropolitan Fiber Systems (MFS), which are setting up local area networks to serve business customers, can undercut the local carrier because they serve only high volume users with new, high-capacit y equipment and nonunion workers. (One report says that MFS can installa private line at a cost 40 percent below t hat oft heprimary carrier. Half of t he reduction wassaid to come f rom lowercompen sat ion for employees.) Ron Bohlin, Allan Roth, and David L. Wenner, "Do LECS Need Magic to Cut Costs?" Telephony, Apr. 19, 1991, p. 31.

The move by local carriers to cut costs has so far largely taken the form of reducing the workforce. Pacific Telesis, for example, has cut its workforce by 18 percent since 1984 and plans another 18 percent reduction over the next 5 years; this is a total of about 25,000 jobs out of a 1984 workforce of 77,000. There is concern that this com petitive pressure on local earners may also discourage or delay investment ininfrastructure and in R&D.

according to its critics.[42] The cost and risk of investment is shifted in part from ratepayers to shareholders. Cost reductions are easier to predict and quantify than uncertain future revenue from facilities enhancement.

Some states have recognized these problems and arc experimenting with new forms of incentive regulation. Tennessee, for example, specifies special network investment requirements and allows faster capital recovery in return for accelerated investment in infrastructure. The most ambitious plans are in Illinois, New Jersey, New York, Tennessee, and Washington. New Jersey Bell is investing $1 billion by 1999 to expand narrowband capabilities and begin installing broadband network services. Tennessee has a similar 10 year plan to achieve universal ISDN availability in urban areas.[43]

State commissions and the FCC have another handle on investment decisions through the rules for equipment depreciation. PUCs typically require of telephone companies very long depreciation schedules for net work equipment. This keeps rates low, but also slows down the replacement of old equipment with modern equipment.[44] The FCC has just proposed new incentives for local telephone companies to invest in fiber optics and computerized switches by allowing them to depreciate their investment in old equipment more rapidly. The FCC regulates interstate access charges through price caps; these set a mandated ceiling on consumer prices and, within that range, telephone companies can increase their profits (up to about 13 percent) by cutting their costs. If the rate of return exceeds 13 percent, customer charges must be lowered to return half of the surplus profit to customers. Big depreciation expenses reduce a company's reportable profits. This can mean as much as $0.50 additional profit for each additional dollar of depreciation .45

Telecommunications has become a major factor in corporate site selection, especially for corporate headquarters, airlines, financial services, and business services. States are caught in a dilemma of wanting good telecommunications to attract economic development, yet also wanting to keep their residential rates low and to reduce their intrastate long-distance rates to discourage corporate bypass.[46]

Some consumer advocates insist infrastructure modernization could be wasteful; it could benefit only RBHCs and their shareholders, and not the small businesses and

42 Bohlin, Roth, and Wenner, op. cit., footnote 40. For a counterview, see Chris Gadrowski, "Counterpoint: Don't Shackle Incentive Regulation," *Public Utilities Fortnightly,* Apr. 15, 1991. Gadrowski objects to regulators specifying inputs (investments) rather than outputs (level **and quality of services) but acknowledges that incentive regulation can create the incentive to reduce network investment unless it is coupled with penalties** for reduced service quality levels (in the form of making refunds to customers).

43 Information provided by Ronald G. Choura of the Michigan Public Service Comm ission and the Alliance for Public Technology, February 1993.

44 In *Louisiana PUC* v. *FCC,* 476 US 355 (1986), an FCC order preempting conflicting state depreciation policy was set aside.

45 "FCC Proposes Incentives for Local Phone Companies," *Telecom* Highlights *International,* Dec. 16,1992, p. 11.

46 Paul E. Teske, "State Telecommunications Policy in the 1980s," *Policy Studies Review,* spring 1992, vol. 11, No. 1, p. 118.

households who will pay a large part of the costs. Also, it could squeeze out investments that might otherwise go to smaller and more innovative companies. The alternative to network modernization, however, appears to be reliance on very fast, high capacity packet-switching services and other new technologies, often provided by alternative carriers, that will benefit very large corporate users concentrated in some urban centers, and will offer Iittle or no support for middle-sized and small businesses.

At current rates of industry investment. the domestic infrastructure may be upgraded slowly and unevenly.[47] Much more modernization will be on private networks. This at Ieast would mean that those who benefit most directly will pay. But some economists warn that corporations may not promote interconnectivity at the most desirable levels. Even large users may not by themselves generate enough traffic to justify some of the benefits that would be possible with broad access. Alternative carriers will be attracted only in cities large enough to allow several companies, or many companies, to reach economies of scale.

Conclusions

The argument that the U.S. telecommunications infrastructure is in perilous decline cannot be supported on the basis of publicly available information. Usage of the telecommunications network continues to increase and is significantly higher than in European countries. U.S. companies operating in Europe attest to the general superiority of U.S. telecommunications and information services (as discussed in chapter 5). The number of new domestic services continues to increase: the last 1() years have seen the explosion in facsimile communications, data networking, and cellular services. New players are crowding into the industry, such as cable TV companies and alternative access providers. There is vigorous competition among equipment manufacturers, many of which are small, new operations carving out niche markets. Corporations have created substantial and finely-tailored private networks that arc now being integrated with the public switched telephone network. As the NTIA infrastructure report concludes, the United States has ‘‘a well-developed, advanced infrastructure, characterized by a very high access-line density, a robust level of telephone usage, and a heavy emphasis on ‘‘modernization."[48]

Meanwhile, there is no strong public policy guiding or encouraging planning for the networks of the future. It is by no means certain that the highly competitive market that has developed in the last decade provides the incentives necessary for a level of investment--in infrastructure modernization and in R&D—that will be needed to keep the U.S. teleccommunications industry and the U.S. telecommunications infrastructure in excellent condition. Many economists say a competitive market economy does not automatically generate the optimal magnitude and allocation of R&D. [49]

The evidence is inconclusive at best as to whether industry investment in infrastructure and R&D has significantly declined in the short period (about 5 years) of overseas

There is **no** *strong* **public policy** *encouraging planning for the networks of the future.*

[47] Egan and Wildman, op. cit., footnote 1, p. 40.

[48] NTIA, op. cit., footnote 7, p. 197.

[49] Richard Nelson, op. cit., footnote 13.

BOX 9A. TELECOMMUNICATIONS INDUSTRY INVESTMENT: SOURCES OF UNCERTAINTY OR CONFUSION

Investment categories	Caveats	Examples/ explanation
Domestic:		
Infrastructure modernization and R&D expenditure	Historical discontinuities	Introduction of competition; total market includes MCI, Sprint, as well as AT&T.
	Divestiture	Separation of Bell operating companies from AT&T. Separation of services from equipment manufacturing.
	Changes in accounting and reporting procedures	Financial Standards Accounting Board changes; comparability of income and expenditure categories before and after change is reduced or uncertain.
	Acquisitions, mergers, joint ventures, sales of company components	AT&T acquisition of NCR; RBOCs entry into cellular market.
	Decreasing technological costs	Costs of computer power, fiber cable, other components decreasing; possibly more plant/equipment per constant dollar.
	Technological change	Shift from hardware to software with different cost structure for research, development, deployment; movement toward "intelligent networks," with changing distribution of costs between network and customer premises equipment, also differing depreciation schedules.

expansion, or even whether it has declined as a result of divestiture, several years earlier (although this appears more likely). (See box 9-A.) The possibility of a sustained decline in infrastructure investment, or in long-range R&D, merits very close monitoring, by regulatory agencies and by Congress, for the next several years.

As the debate over the future of communi - cations infrastructure builds to a head in Congress—with strong sentiment both for repealing and for temporarily codifying the MFJ restrictions--RBHCs are walking a very thin tightrope. In making the case to legislators that the present regulatory condi- (ion disfavors their core business to the point

Investment categories	Caveats	Examples/ explanation
	Data quality	Deregulation and Paperwork Reduction Programs reduce regulatory reporting requirements; telecom companies refuse to divulge proprietary data, especially on R&D.
International comparisons	**Industry structure**	**Government ownership vs. private sector; monopoly vs. oligopoly; geographical scale.**
	Accounting practices	**National differences in accounting practices and categories.**
	Regulatory differences	Varying degrees and kinds of data kept; varying public access to data.
	Overly **broad reporting categories**	**Lumping of military, civilian, public and private investment or expenditure. Lumping of network expansion (addition of access lines) and modernization (technological upgrading).**
	Inappropriate comparisons	**AT&T and European equipment manufacturers (i.e. mixed services/technology development vs. pure technology development). RBHCs and European equipment manufacturers (i.e. services providers vs. technology developers).**

SOURCE: OFFICE OF TECHNOLOGY ASSESSMENT, 1993.

that overseas investments represent significantly better options, RBHCs potentially heighten the concern that their captive domestic customers are being neglected. The companies are wary of violating MFJ rules, and the operations for regulated local telephone service are separated from the nonregulated side of the business. There is no evidence of wrongdoing, but RBHCs have failed to assuage fears about cross-subsidization.

The case cannot be made, from the evidence at hand, that R&D expenditures are declining as a direct result of the flow of funds to investment overseas. It is clear, however, that industry R&D expenditures are likely to shrink, or at best to remain flat, in the foreseeable future, and that R&D is

also likely to be more tightly focused on near-term products and services innovation. By industry self-reports, this is an effect of the move toward competition in regulated as well as unregulated markets, and in both domestic and international markets.

Many people in the industry argue that more R&D would be performed or funded by the RBHCs if they were not prohibited from manufacturing telecommunications equipment. It is likely that the allocation of R&D expenditures across sciences (i.e., physical sciences as compared with information sciences) might change, but whether the total volume of R&D expenditures would increase is less certain. It should be noted that even with the prohibition on equipment manufacturing in place, there is a strong technological linkage between manufacturers and users of telecommunications equipment, due to continuing need to modify network equipment, once it is in place, through modular hardware expansion or replacement and generic software revisions.[50] Through Bellcore RBHCs play a central role in the development of technical advisories and requirements, specifications and standards for telecommunications equipment that will be part of or connected to the public-switched networks and that will support the development of services for domestic customers and for export to overseas markets. The ability of U.S. telecommunications firms to compete in overseas markets, for services as well as equipment, will very likely suffer if levels of R&D funding and performance drop significantly.

Close monitoring is needed to detect any trends toward harmful domestic effects from overseas activities, and any harmful effects on overseas competitiveness as a result of unnecessary and unintended domestic policy or regulatory constraints. This monitoring would probably have to be legislatively mandated. Major carriers have said they strongly object to any additional monitoring or mandatory data reporting. However, the FCC already requires common carriers to report expenditures for R&D as well as for infrastructure modernization and expansion in a standard format that could allow comparison of expenditures over time and integration of data across reporting carriers. A new legislative mandate would probably be needed to extend the R&D performance reporting to the regional Bell holding companies and to other telecommunications services providers. Alternately, a new legislative mandate could allow data now collected by the Bureau of the Census and analyzed by the National Science Foundation to be aggregated into smaller, appropriately designed categories to reveal long-range trends in telecommunications-related R&D and make this information available to policy makers in a way that would protect company privacy, Standardized data on all foreign investments would also be needed. However, the Bureau of Economic Analysis already collects some information on direct investment in foreign communicant ions, in highly aggregated form.

New reporting requirements would run directly counter to the strong effort over the last decade to reduce corporate reporting requirements (as described in chapter 8), and would possible strain the current budget of the FCC and the data collection agencies. Since much of this data is already reported in one form or another, however, the additional

50 Harris, op. cit., footnote 14.

reporting burden for industry would be small. Government would incur some additional costs for processing and analysis.

A less direct alternative would be a request from Congress for consultation and cooperation among state regulators, through the National Association of Regulatory Utility Commissioners, with the same end in view. The State regulators, by harmonizing their regulatory practices and reporting requirements, could create a monitoring system and integrate information about infrastructure modernization across state boundaries. They would then be able to develop joint strategies, if needed. for setting infrastructure modernization goals and consumer protection strategies. However, as already noted, state regulators have some conflicting interests with regard to infrastructure modernization, which in part depend on the varying economic development strategies of their states. As a group, nationwide, they may lack both the resources to carry out systematic and coordinated monitoring. and the comprehensive viewpoint to agree on priorities for national and international network development, Moreover, this approach is not as directly applicable to monitoring R&D trends, since this activity is less widely dispersed and the information, considered more proprietary, may be more difficult to extract from telecommunications holding companies. However, unless some action is taken to develop better information, public policy makcrs at both the Federal and state levels will remain in the dark about potentially damaging trends in telecommunications investment.

Reviewers and Contributors

A

APPENDIX

Lester **M. Alberthal, Jr,**
Chairman, President and CEO
Electronic Data Systems Corporation

Peter Allen
Consultant, Telecom Regulations
American Express Europe, Ltd.

Dennis Amari
Legislative Analyst
Bellcore

Robert W. Anthony
Research Staff Member
Operational Evaluation Division
Institute for Defense Analyses

Robert G. Atkins
International Trade Specialist
Office of Service Industries
International Trade Administration
U.S. Department of Commerce

Kim M. AuBuchon
District Manager
Federal Government Affairs
AT&T

Carol Balassa
Director
Telecommunication Services and Trade
Office of the U.S. Trade Representative

Jim Ball
Associate Director
office of International Communications
U.S. Federal Communications Commission

Malcolm R. Bates
Deputy Managing Director
The General Electric Co,

Abdelhak Benkirane
Counselor, Technical Cooperation
United Nations International Telecommunication Union

Keith **Bernard**
Vice President
International & Regulatory Affairs
Cable & Wireless North America, Inc.

Fred J. Bieganski
Infrastructure Development Officer
Agency for International Development

William Bien
International Trade Analyst
International Trade Commission

Mary Ann Blatch
Chief of Government Affairs
Readers Digest

Robert T. Blau
Director
Policy Analysis
Bell South

Kenneth W. Bleakley
Senior Deputy Coordinator and Director
Bureau of International Communications and Information Policy
U.S. Department of State

Henning Boe
Staff Director
Telecom Denmark

Robert R. Bohannon
Managing Director
HQ/International Communications
American Airlines

Bruce Bond
Vice President, International Affairs
British Telecom

Peter Bonfield
Chairman and Chief Executive
ICL plc
United Kingdom

Evelyn Boyd
Motorola

Maureen Breitenberg
National Institute of Science and Technology

Sir Leon Brittan
Vice President
Commission of the European Communities

William R. Brittingham
Director
Pacific Telesis Group

Joachim Broudre-Groger
Foreign Office
Germany

C.J. Buckley
Vice President
Communications and Operations
PARS Service Partnership

Jimmy Burk
Director
Engineering and Planning
Federal Express Corporation

Dan Burton
Executive Vice President
Council on Competitiveness

Ellen Burton
Director
Federal Relations
U.S. West, Inc.

David Carpenter
International Trade Consultant
Czechoslovakia

Ulrich Cartellieri
Member
Board of Managing Directors
Deutsche Bank AC
Germany

Johann Cas
Technology Assessment Unit
Postgass, Austria

Margaret K. Cassidy
Attorney
Worldspan

Stu Chiron
Sprint International

Carin Christian
IC&C

Howard L. Clark Jr.
Vice Chairman
Lehman Brothers

Warren Clark
Special Advisor
Bureau of International Communications and Information Policy
U.S. Department of State

John L. Clendenin
Chairman, President and CEO
Bell South Corporation

Kathleen Collins
Assistant Director
Office of International Communications
U.S. Federal Communications Commission

Peter Courtney
ITI International Finance, Ltd.
Ireland

Peter Cowhey
Department of Political Science
University of California, San Diego

Rhonda J. Crane
Director
Federal Government Affairs
AT&T

William A. Crane
Manager
BT Government Relations

Raymond Crowell
Director
Industry Government Planning
COMSAT

Imre Csorba
Deputy Head of Department
Hungarian Telecommunications Company

Arpad I. Csurgay
Deputy Secretary General
Hungarian Academy of Sciences

Marion Dabrowski
Manager, Information Technology
ABB Lummus Crest, Inc.

Diane Davis
AEC Solutions

Parke Davis
Department of Communications
Canada

Jan Degraeuwe
Director
Betelcom, Belgium

Robert Devaney
Executive Director, International
NYNEX Worldwide Services Group

Marty Dickens
BellSouth International

Joseph 1. Dionne
Chairman and CEO
McGraw-Hill, Inc.

Janis Doran
Policy Analyst
Department of Comrnunications
Canada

Ambassador **Diana Lady Dougan**
Center for Strategic & International Studies

John A. Dubret
Managing Director
Communications Engineering
SABRE Computer Services
American Airlines

Georges Dupont
Project Manager
UNESCO, France

Stephen Dutton
International Affairs
NYNEX

Peter Eisler
General Manager
Hungirocom Telecommunications, Ltd.
Hungary

Bernard Ennis
Vice President
Advanced Engineering
ABB Lummus Crest, Inc.

Helle R. Eriksen
Head of Section
General Directorate
Post and Telecommunications
Denmark

Douglas Caffrey Fields
Vice President
Information Services
United Parcel Service

Judith Fincher
EDI/CALS Marketing Manager
HFSI

Stephen C, Finch
International Telecommunications Users Group
United Kingdom

Tim Finton
Counselor for Telcommunications Trade
Bureau of International Communications and Information Policy
U.S. Department of State

James M. Flynn
EDI Services Manager
United Parcel Service

Charles **E.H. Franklin**
Head of Division
Telecommunications & Information Policies
International Chamber of Commerce

Gabor Frischmann
Director
Hungarian Telecommunications Company

Martin **Fuhr**
Director of Telecommunications
The International Herald Tribune
France

Lynne Gallagher
Director
International Regulatory Affairs
Sprint International

Oswald H. Ganley
Executive Director
Program on Information Policy
Harvard University

Hans-Peter Gassmann
Organization for Economic Cooperation and Development

Peter Gerard
Deutsche Bank AG
Germany

Angela **A. Gilroy**
Economics Division
U.S. Library of Congress

Paul Glaser
Consultant

Jack Gleason
Office of International Affairs
National Telecommunications and Information Agency
U.S. Department of Commerce

William R. Godwin
Network Engineering
Encompass

Douglas Goldschmidt
Alpha Lyracom

Steven N. Goldstein
Program Director
Interagency & International Coordination
U.S. National Science Foundation

M. Etienne Gorog
Director
Worldwide Networking Practice
IBM France

Natasha Gospic
Acting Assistant Director General for R&D
Community of Yugoslav PT&T

Richard **Grainson**
Administratcur General Adjoint
Regie des Telegraphed at Telephones
Belgium

George V. Grune
Chairman and CEO
The Reader's Digest Association, Inc.

Jan **Gruntorad**
Head of Data Communications Department
Charles University
Czechoslovakia

Wendell Harris
Assistant Bureau Chief
International Division
FCC Common Carrier Bureau

Dale Hatfield
Hatfield Associates, Inc.

Gerhard Hausmann
Director General
Federal Ministry of Post and Telecommunications
Germany

Hanno Hausmann
Assistant Director
International Affairs
Deutschc Telekom, Germany

John F. Healy
Senior Advisor
United Nations Development Programme

John Henry
Office of Telecommunications
International Trade Administration
U.S. Department of Commerce

Mary L. Henze
Staff Manager
Public Policy Analysis
Bell South

Ken Herold
Director of Information Technology
HOK

Pierre Hessler
Chairman
IBM France

Mark Hill
Manager, Business Planning
PARS Service Partnership

Lyell Holmes
Director
Local Area Telecommunications
Fluor Daniel

Pal Horvath
Director General
Hungarian Telecommunications Company

Casten **Jensby**
Director Business Development
Telecom Denmark

Volker Jung
Senior Vice President
Siemens, Germany

Laurel B. Kamen
Vice President, Government Affairs
American Express Company

Tim Kelly
Communications Policy Analyst
Organization for Economic Cooperation and Development

Earl Kennett
Vice President, CCB Programs
National Institute of Building Sciences

Hal Kimball
Office of International Affairs
National Telecommunications and Information Administration
U.S. Department of Commerce

Steve Kindel
Financial World

Lothar A. Kneifel
Debevoise & Plimpton

Zsolt Kohalmi
Chairman
Interagency Committee on Tech Transfer and Export Administration
Ministry of International Economic Relations
Hungary

Peter Kral
Software Engineer Consultant

Debra M. Kriete
Pennsylvania Public Utility Commission

Andrzej Ksiezny
Director
State Agency of Radiocommunications
Poland

Joanne K. Kumekawa
Telecommunication Analyst
Office of Plans and Policy
U.S. Federal Communications Commission

Ann Lane
Director
Federal Relations
Bell Atlantic Network Service, Inc.

Lawrence E. Levinson
Senior Vice President
Government Relations
Paramount Communications, Inc.

W. Kenneth Lindhorst
Vice President, International Services
AT&T

John K. Livingstone
Manager, Correspondent Relations
BT North America

Randolph C. Lumb
Vice President
Government Relations
AT&T

Mark MacCarthy
Vice President
Government Relations
Capital Cities/ABC, Inc.

Clyde Manning
Executive Assistant
BellSouth Corporation

Herbert E. Marks
Squire, Sanders and Company

Johan Martin-Lof
Director, International Affairs
Swedish Telecom

Tim May
Freedom of Technologies, Inc.

Doreen F. McGirr
Bureau of International Communications and Information Policy
U.S. Department of State

TK. McInernay
Deputy Director
Global Network Bids
AT&T

James K. McKean
Communications Manager
The Church of Jesus Christ of Latter-Day Saints

Des McLauglin
Vice President
Marketing
Telecom Ireland

Andy Mecklinberg
Regulatory Policy
Bell Atlantic

Rudolf Meijer
Principal Administrator
Commission of the European Community

Linda Meyer
Meyer Enterprises

Loretta **Michaels**
Manager
Market Analysis
Northern Telecom Europe, Ltd.
United Kingdom

Sam Midkiff
Managcr
Communications Planning
PARS Service Partnership

Greg Millert
Vice President
Federal Government Affairs
AT&T

Mahal Mohan
District Manager
Government Affair-s
Technology and Infrastructure
AT&T

Brian Moir
Fisher, Wayland, Cooper, and Leader

Martin Morell
Principal
Network Dynamics Associates, Inc.

John Morgan
Vice President
Government Relations
Communications Workers of America

Mike Morris
Vice Chairman CEPT Telecom
Deportment of Trade and Industry

David Mulcaster
Director General, CD&P
Department of Communications
Canada

Jan Muller
Czech National Council IT Consultant
Ceska Narodni Rada
Czechoslovakia

Rupert Murdoch
Chief Executive
The News Corp.. Ltd.
United Kingdom

Mark B. Myers
Senior Vice President
Corporate Research & Technology
XEROX Corporation

Tom Nadelhoffer
Manager, Communications Planning
Worldspan

Kaneo Nakamura
Counselor
The Industrial Bank of Japan, Ltd.

Eric Nelson
Director of International Affairs
Telecommunications Industry Associ at ion

Derek Nicholas
Vice President
International Telecommunications Systems
United Kingdom

Emmanouil Nicolaidis
CEPT Telecom Chairman
Hellenic Telecommunications Org (OTE)
Greece

Cynthia Nila
Telecommunications Policy Analyst
Telecom Statistics
International Trade Administration
U.S. Department of Commerce

Tim Nulty
Senior Economist
World Bank

David P. O'Neill
Staff Vice President
Telecommunications
Inter-Continental Hotels Group
United Kingdom

Judith O'Neill
Steptoe & Johnson

William G, Oates
Director of Telecommunications
World Headquarters
ITT Sheraton Corporation

Janice Obuchowski
President
Freedom Technologies, Inc.

Philip C. Onstad
Manager
International Public Policy
International Communications Association

Rolf Orrsten
Coordinator International Affairs
Swedish Telecom

Jiri Orsag
Computer Centre
Prague Institute of Chemical Technology
Czechoslovakia

Bruno Oudet
Scientific Attache, Information Tech.
Embassy of France

David Palmer
Chief Executive
Financial Times of London

Gabor Patocs
Manager International
Alcatel-Standard Electrica, Spain

Scott D. Pearson
Office of the U.S. Trade Representative

Kenneth Philips
Office of Telecommunications Policy
Citibank, N.A.

Bob Phillips
Deputy General Manager
Land Mobile
INMARSAT

Tony Phipps
Abt Associates

Paul Pisjak
Technology Assessment Unit
Postgasse, Austria

Dietmar **Plesse**
Executive Officer
Federal Ministry of Post and Telecommunications
Germany

David Porter
Government Affairs Director
AT&T

Melanie Posey
Telecommunications Specialist
International Trade Commission

Jean Prewitt
Associate Administrator
Office of International Affairs
National Telecommunications and Information Administration
U.S. Department of Commerce

William Ramage
Bechtcl Corporation

J. Bradford Ramsey
Deputy Assistant General Counsel
National Association of Regulatory Utility Commissioners

Gerold Reichle
Deputy Director
Federal Ministry of Post and Telecommunications
Germany

Paul Reid
Head
Technical Organization Department
European Telecommunications Standards Institute, France

Mogens Ritsholm
Senior Engineer
General Directorate of Post and Telecommunications
Denmark

Frank A. Robert
Commstrategies, Int.

Kenneth Robinson
Attorney

Larry Rocha
Wimbley Allison Tong Goo

Karen S. Rogers
Director
Government & International Relations
Southwestern Bell Corp.

Walda Roseman
President
CompassRose, Inc.

Richard **M. Rosenberg**
Chairman and CEO
Bank America Corporation

Bert de Ruiter
Head Telecommunications and Post Department
Ministry of Transport and Public Works
The Netherlands

Charles Rush
Associate Administrator for International Affairs
National Telecommunications and Information Administration
U.S. Department of Commerce

Jim Russell
US West Newvector Group, Inc.

Thomas R. Rutherford
Assistant Director of Engineering and Construction
Office of the Assistant Secretary of Defense

Anthony M. Rutkowski
Vice President
Sprint

Katrina Saarinen
Chief Inspector
Department for Communications Admin.
Ministry of Transport and Communications
Finland

Martin Salamon
Head of Section
National Telecom Agency
Denmark

Dana Sauer
Executive Director
Integrated Construction Association

Jeanne Schaaf
Assistant Vice President
Government Affairs
BT North America

Thomas Schnoring
WIK GmbH
Germany

John L. Segall
Vice Chairman
Corporate Planning and Development
GTE Corporation

Eugene Sekulow
Executive Vice President
Worldwide Services Group
NYNEX

Suzanne Settle
Office of International Affairs
National Telecommunications and Information Administration
U.S. Department of Commerce

Helen Anderson Shaw
Director
Division of International Telecommunications
National Telecommunications and Information Administration
U.S. Department of Commerce

Irvan H, Shefrin
President
Network Performance Systems

Jerry Sincoff
President
HOK

Cathy Slesinger
Government Affairs
NYNEX

Peter Smith
Manager
International Communications
Reuters, Ltd., United Kingdom

Oliver Smoot
Executive Vice President
Computer and Business Equipment Manufacturers Association

Anna Snow
Commission of the European Community

Stefan Stanislawski
Senior Consultant
Analysis Limited, United Kingdom

Paul Startz
Paul, Weiss, Rifkind, Wharton

Roger F. Stechschulte
Director
Office of Telecommunications
International Trade Administration
U.S. Department of Commerce

Dan **Stefanescu**
Directeur General (Develop.)
Ministere des Communications
Romania

Milan Sterba
Ingenieur
INRIA Rocquencourt, France

Kathy Stewart
AT&T

Ken Stowe
Walt Disney Imaginering

John Streeter
Vice President for CSFR
Bell Atlantic International

Andras Sugar
General Manager
WESTEL, Hungary

David Sun
Assistant Vice President
Communications Management
CIGNA

S. Blake Swensrud
Editor in Chief
Eastern European & Soviet Telecom Report

Paul **Teicholz**
Director
Center for Integrated Facility Engineering
Terman Engineering Center

Richard Thayer
Director
Federal Government Affairs
AT&T

Dana Theus
International Technology Representative
Office of Government Affairs
EDS

Moira Thornett
Director, Technical Support
Corporate Headquarters
Holiday Inn Worldwide

Donald Tice
Booze, Allen & Hamilton

Svetoslav Tinchev
Dept. Head/Project Implementation
Committee of Post Telecommunications and Information
Bulgaria

Russ Tirella
Consultant

Greg **Tolander**
Corporate Director
Application Systems Delivery
Holiday Inn Worldwide

Hal Turner
President
Rockefeller Center
ITT Telecom Netherlands US, Inc.

Anton Valk
Rockefeller Center
PIT Telecom Netherlands, US, Inc.

Rick van Leeuwen
Director
Wide Area Telecommunications

Lawrence K. Vanston
Technology Futures, Inc.

Olympia Vassiliadou
Chief Engineer
Hellenic Telecommunications Organization
Greece

Martin Wassell
Economic Director
Policy and Programme
International Chamber of Commerce

Bjorn Wellenius
Telecommunications Specialist
The World Bank

Obie Whichard
Chief Research Branch
International Investment Division
Bureau of Economic Analysis
U.S. Department of Commerce

John White
President
Information Technology Group
Texas Instruments, Inc.

Robert M. White
Undersecretary of Technology
U.S. Department of Commerce

Margaret Wigglesworth
Executive Director
Coalition of Service Industries

Peyton Wynns
Chief
Industry Analysis Division
U.S. Federal Communications Commission

Roxane Wiser
Ameritech International

Thomas M. Woods
Vice President
Information Services
Halliburton Company

Robert E. Woodyard
Assistant Vice President
Communications & Information Services Tech.
Delta Air Lines, Inc.

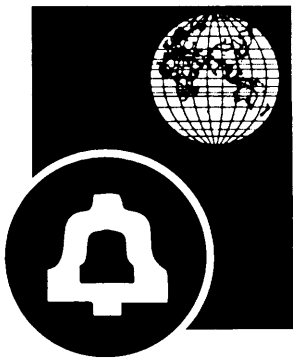
Henrikas Yushkiavitshus
Assistant Director General for CI&I
UNESCO

Amy Zirkle
Manager
Government Affairs
American Express Company

Gelencser Zsolt
Financial Analyst
Hungarian Telecommunications Company

Acronyms

B
APPENDIX



AEC	architectural, engineering, and construction
AID	Agency for International Development (U. S.)
ASST	Azienda di Stato per i Servizi Telefonici (Italy)
AT&T	American Telephone and Telegraph (Company)
ATM	Asynchronous Transfer Mode
ATM	Automated Teller Machine
BDT	Bureau of Telecommunications Development (ITU)
BEA	Bureau of Economic Analysis, U.S. Department of Commerce
BOC	Bell operating company
BSI	BellSouth International
BT	British Telecom
CAD/CAM	computer-aided design/computcr-aided manufacturing
CCITT	Consultative Committee for International Telephone and Telegraph, ITU
CEE	Central and Eastern Europe
CEETEC	Central and Eastern European Telecommunications Cooperative Mechanism
CEI	comparably efficient interconnection
CENTREX	central exchange
CEO	chief executive officer
CIP	Communications and Information Policy (Bureau of, U.S. Department of State)
CMEA	Council for Mutual Economic Assistance, or Comecon
COCOM	Coordinating Committee on Multilateral Export Control
CSI	Coalition of Service Industries
DRG	Directorate of Regulatory Affairs (France)
DSP	digital system processing (chips)
EBRD	European Bank for Reconstruction and Development
EC	European Community
EDI	electronic data interchange
EDS	Electronic Data Services, Inc.
EFTA	European Free Trade Association
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission (U. S.)
FLAG	Fiberoptic Link Around the Globe (NYNEX)
GATT	General Agreement on Trade and Tariffs
Gbps	billion bits per second
GEN	General European Network
GSDN	Global Switched Digital Network (AT&T)
GSM	Global System for Mobile (communications), Groupe Speciale Mobile
GTE	General Telephone and Electronics
GVPN	Global Virtual Private Network (Sprint)
HTC	Hungarian Telecommunications Company
IAB	Internet Architecture Board
ICA	International Communications Association

IDC	International Digital Communications
WITS	international message telephone services
INTUG	International Telecommunications Users Group
IRI	Instituto per la Ricostruzione Industrial (Italy)
ISAC	Industry Sector Advisory Committee
ISDN	Integrated Services Digital Network
ISO	International Standards Organization
ITA	International Trade Administration, U.S. Department of Commerce
ITU	International Telecommunication Union
IXS	interexchange carriers
kbps	thousand bits per second
KDD	Kokusai Denshin Denwa Co., Ltd.
LAN	local area network
LEC	local exchange carrier
MFJ	Modified Final Judgement
MFN	most favored nation (clause)
MAN	metropolitan area network
Mbps	million bits per second
NAFTA	North American Free Trade Agreement
NARUC	National Association of Regulatory Utility Commissions
NREN	National Research and Education Network
NTIA	National Telecommunications and Information Administration, U.S. Department of Commerce
OECD	Organization for Economic Cooperation and Development
OMB	Office of Management and Budget (U. S.)
ONA	Open Network Architecture
ON?	Open Network Provision
OPIC	Overseas Private Investment Corporation
OSI	Open Systems Interconnection
PBX	private branch exchange
PCN	Personal Communications Network
PCS	Personal Communications Services
POTS	"plain old telephone service"
PTO	public telephone operator
Pi-r	Postal, Telephone, and Telegraph (Administration)
PUC	Public Utility Commission
RBHC	regional Bell holding company
RBOC	regional Bell operating company
SEED	Support for Eastern European Democracies Act
SIP	Societa Italiana per l'Esercizio delle Telecommunicazioni (Italy)
SITA	Societe Internationale de Telecommunications Acronautiques
SMDS	Switched Multi-Megabit Data Service
SONET	Synchronous Optical Network
SS7	Signaling System 7
SWIFT	Society for Worldwide Interbank Financial Telecommunications
TCI	Telecommunications, Inc.

TPSC	Trade Policy Staff Committee (U. S.)
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UPS	United Parcel Service
USTR	United States Trade Representative, Office of (U. S.)
VPN	virtual private network
VSAT	very small aperture terminal
WAN	wide area network
WATTC	World Administrative Telegraph and Telephone Conference

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