THE U.S. TELECOMMUNICATIONS SERVICES INDUSTRY

Assessing Competitive Advantage

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August 1995

ESA/OPD 95-4

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ABSTRACT

Since 1984, the U.S. telecommunications services industry has experienced profound changes caused by deregulation and rapid technological change. Competition now exists in almost all segments of the domestic industry. Local services, the only sector of the industry that remains monopolistic, currently face the prospect of increased competition as changes in technology and law enable various providers to compete in local markets.

The United States is the largest market for telecommunications services, with approximately one third of the total global market in 1993, as measured by revenue. Employment growth in the industry has been relatively flat, while productivity gains have been rapid. Value-added per employee hour grew at an annual rate of 6.1 percent between 1982 and 1992. Gross output per employee grew by 6.4 percent over the same period. The telecommunications services industry in the United States leads Japan, Germany, France, and the United Kingdom in total factor productivity.

The availability of services to businesses and consumers in the United States has increased dramatically as advances in telecommunications network technology have broadened the capabilities of the U.S. telecommunications infrastructure. Although it is extremely difficult to make cross-country comparisons in telecommunications, most measures indicate that the United States has one of the most advanced telecom-munications infrastructures.

In addition to domestic growth, country-to-country and foreign markets are also growing. The industry is becoming more global and opportunities for investment in telecommunications services abroad are increasing. Certain industry segments are growing at faster rates in foreign markets than in the United States; e.g., mobile and cellular services. Increased competition in the U.S. domestic market has enabled many U.S. firms to develop a competitive advantage in providing telecommunications services and many are expanding abroad to take advantage of growing foreign markets. These firms often face artificial barriers to free and fair competition. Foreign regulations prevent many U.S. firms from successfully entering specific market areas.

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INTRODUCTION

As the twentieth century draws to a close, some observers suggest that the world is moving out of the Industrial Era into an "Information Age." New technologies that allow the rapid transmission of sounds, images, and data are fueling this movement. The telecommunications services industry is playing a central role in the transition. It is an increasingly important component of the U.S. economy in terms of revenue and employment and a cornerstone of business operations in manufacturing, retailing, wholesaling, and finance.

Since AT&T's divestiture in 1984, competition, and ensuing technological advances have brought about fundamental changes in the industry. The changes have blurred the boundaries between industry segments and eliminated many distinctions among service providers. They have also increased the market-based signals to the industry, fostering greater efficiency and inspiring rapid innovation. These developments have made U.S. telecommunications service providers highly competitive in world markets. Whether U.S. firms can maintain their competitive position depends upon their ability to take advantage of market opportunities. This, in turn, depends on the technological, economic, and political forces shaping the industry.

The present analysis of the U.S. telecommunications services industry is divided into three sections. The first assesses the industry's size, structure, and competitiveness. The second examines past and present forces influencing the industry. The third identifies evolving geographic and product markets.

I. STRUCTURE AND PERFORMANCE OF THE INDUSTRY

1. Structure

Telecommunications, as defined in this report, is any electronic transmission, emission, or reception of information by wire, radio, optical or other electromagnetic systems between specific places. It excludes non-electronic transmissions, such as postal service, and mass media services, such as radio and television broadcasting. The information transmitted may be sound, images, or bits of data. Transmission may be two-way (as in a telephone conversation) or one-way (as in paging).

The technology used to construct a network determines the quality and range of services that communications carriers can offer. Advanced networks, such as those built with fiber optic cable, can carry a greater volume of information and a greater range of transmission types (e.g., images and data as well as voice transmissions). Similarly, the routing technology (e.g., computer-controlled switches) determines the speed and accuracy with which a transmission moves from its origin to its destination.[1]

The telecommunications services industry includes, but is not limited to, local and long-distance telephone service, cellular and mobile services, value-added network services, enhanced services, and on-line information services. Long-distance services include toll services between points within the United States and services between the United States and other countries.

Three Standard Industrial Classification codes define the telecommunications services industry: Radiotelephone Communications (SIC 4812); Telecommunications, Except Radiotelephone (SIC 4813); and Telegraph and other Message Communications (SIC 4822). The industry can be divided into three

[1] A single transmission may use one or a combination of technologies as it travels from its origin to its destination.

sectors: Wireline, Wireless, and Telegraph and Other Services. These definitions, however, are becoming less valid as new technology changes the industry and market structure.

1.1 Local and Long Distance Wireline Services[2]

The Wireline services industry (SIC 4813) uses terrestrial cable and fiber optic technology to provide data and voice telephone communications. Local exchange service[3] in the United States is provided by about 1,325 local telephone companies. This figure includes 7 local Regional Bell Holding Companies (RBHCs), created by the 1984 AT&T divestiture, and independent local telephone companies.

Four categories of calls make up long-distances services: local toll calls (i.e., intra-LATA); intrastate long-distance calls; interstate long-distance calls; and international calls.[4] Local exchange carriers and long-distance companies compete in the local toll call market. Long-distance companies provide interstate and international calls. Long-distance calls are routed through the local networks to long-distance networks, thus long-distance companies must purchase access to networks owned by local exchange carriers to complete calls. Similarly, long-distance carriers negotiate access agreements with the telecommunications providers in foreign countries to complete international calls.[5]

Long-distance services in the United States are provided by roughly 500 primarily regional companies. Three firms compete nationally: AT&T, MCI, and Sprint. Combined, they accounted for an 86 percent market share in 1993. This combined market share has declined steadily since the 1984 breakup of AT&T, when these three firms controlled 97 percent of the market.

1.2 Wireless Services

The Radiotelephone Communications industry (SIC 4812) provides paging, cellular telephone, personal communication services, in-flight phone service, satellite communication services, direct broadcast entertainment, and computer communications network services. Wireless is one of the most competitive sectors of the telecommunications industry. The major firms in the wireline industry also serve the wireless market.

Satellite services use fixed earth stations or fixed satellite services for broadcasting, data transmission, and telephone service. Video transmission constitutes the bulk of the current domestic satellite capacity.

1.3 Telegraph and Other Services

Any offering over the telecommunications network that is more than a basic transmission is included in the Telegraph and Other Message Communications industry (SIC 4822). These services consist of cablegram, electronic mail, facsimile, telegraph, telex, data processing services, and on-line databases provided through both wire and wireless technologies. Data processing services and on-line databases, which

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[2] Although local access and long distance providers are discussed under Wireline Services, both industries are aggressively pursuing wireless technologies.

[3] Local telephone services and local toll service.

[4] Intra-LATA = within local access and transport areas.

[5] These traditional market divisions are being broken down by regulatory and technological changes that are introducing greater competition. Long-distance providers have recently moved into many local toll call markets. Local exchange carriers are seeking regulatory changes that will allow them to compete in long-distances markets. Simultaneously, long-distance and cable television companies are seeking to compete in local exchange markets. Finally, wireless services, such as cellular services are competing in each of these markets.

provide on-line computational and archival resources, represent the largest segment of Telegraph and Other Services.

2. Industry Performance

In 1993, estimated revenue from the telecommunications services industry totaled $178 billion. It is approximately twice the size of the computer industry and 10 percent larger than the petroleum industry (U.S. Bureau of the Census 1995, p. 3).

2.1 Output

Traffic measured in minutes increased annually in local, intrastate, interstate, and international markets during the 1980s. (Figures 1 and 2.) International traffic minutes have grown the fastest at an average annual rate of 16 percent, since 1980. Of the domestic services, interstate traffic has grown the fastest at an annual rate of 9 percent. Local services have grown the slowest with an annual growth rate of 2 percent.

Since the Telegraph and Other Service sector covers a vast array of services, reliable output data for the sector are difficult to obtain. Certain segments, such as electronic mail services, switched data services, and public data services are expanding rapidly. Facsimile transmission is also expanding, although there is no reliable measure of the number of transmissions, because they appear on the network as telephone calls.

2.2 Prices

Price trends for telecommunications services vary by industry segment. During the 1980s, the CPI for local services generally increased faster than inflation as measured by the CPI for all items. (Table 1.) In 1989, local service prices moderated and began to lag inflation. In contrast, prices for intrastate toll services have either fallen or lagged inflation for most years since 1984. Telecommunications service prices accelerated in 1993 and 1994. AT&T filed for a rate increase of 1.2 percent in July 1993, and AT&T's main competitors, MCI and Sprint, raised their rates as well. Prices for international services originating in the U.S. have generally fallen over time. Figure 3 shows a rate index[6] constructed from AT&T rates for 7 minute dial direct calls to selected countries.[7] Prices declined until 1992, then turned upward.

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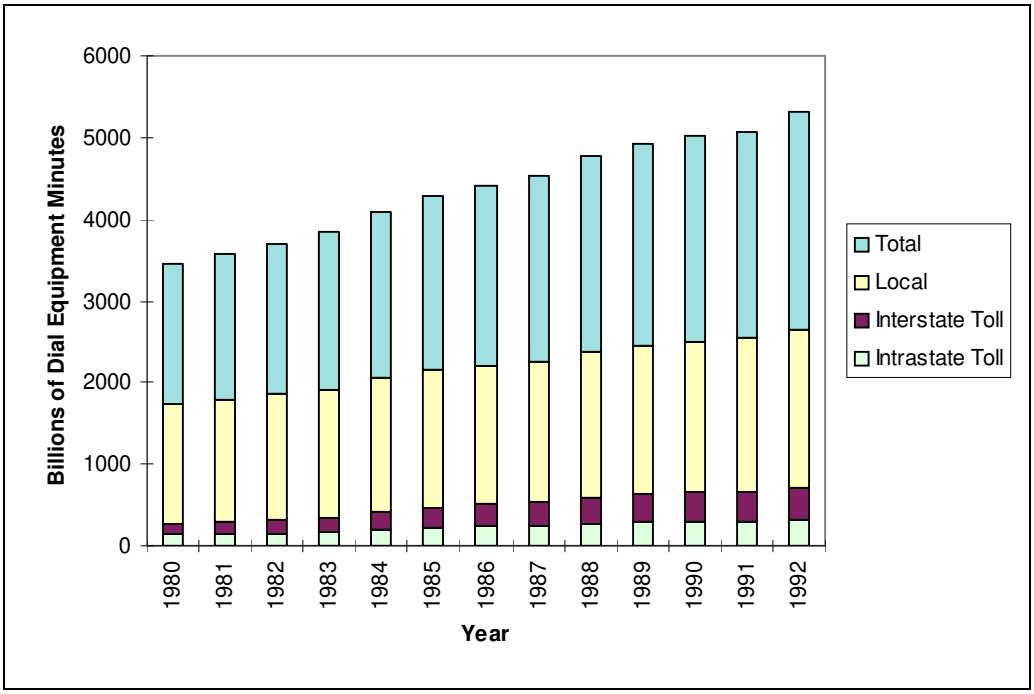
[6] The rate index covers Australia, Brazil, Canada, China, Columbia, the Dominican Republic, Egypt, El Salvador, France, Germany, India, Israel, Italy, Japan, Jamaica, Korea, Mexico, Nigeria, the Philippines, Poland, Russia, Saudi Arabia, South Africa, Taiwan, and the United Kingdom.

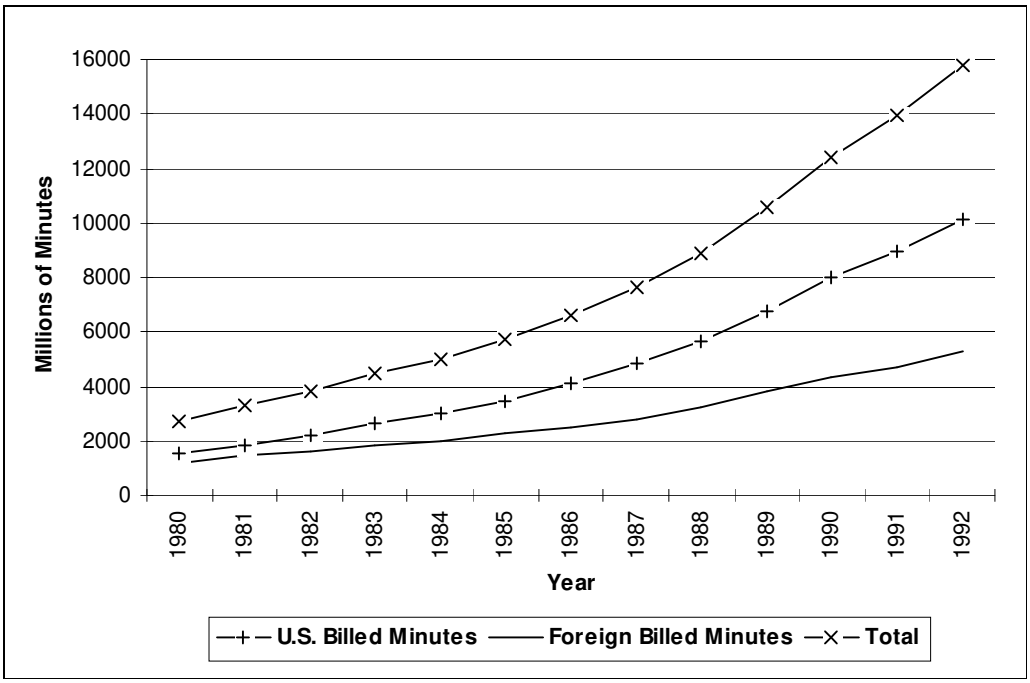
[7] Based on settlement receipts and revenue shares, AT&T holds the largest share of the U.S. international services market. Since this is also a very competitive market, AT&T rates are a good indicator of the U.S. industry price trends for international services. (Market share and settlement receipt data: FCC, 1994, p. 19 and pp. 38-39.)

Figure 1
Domestic Telecommunications Output



1/ One Dial Equipment Minute = two conversation minutes.
Source: Federal Communications Commission, 1994, p. 307.

Figure 2
International Telecommunications Output



Source: U.S. Federal Communications Commission, March 1994, p. 19.

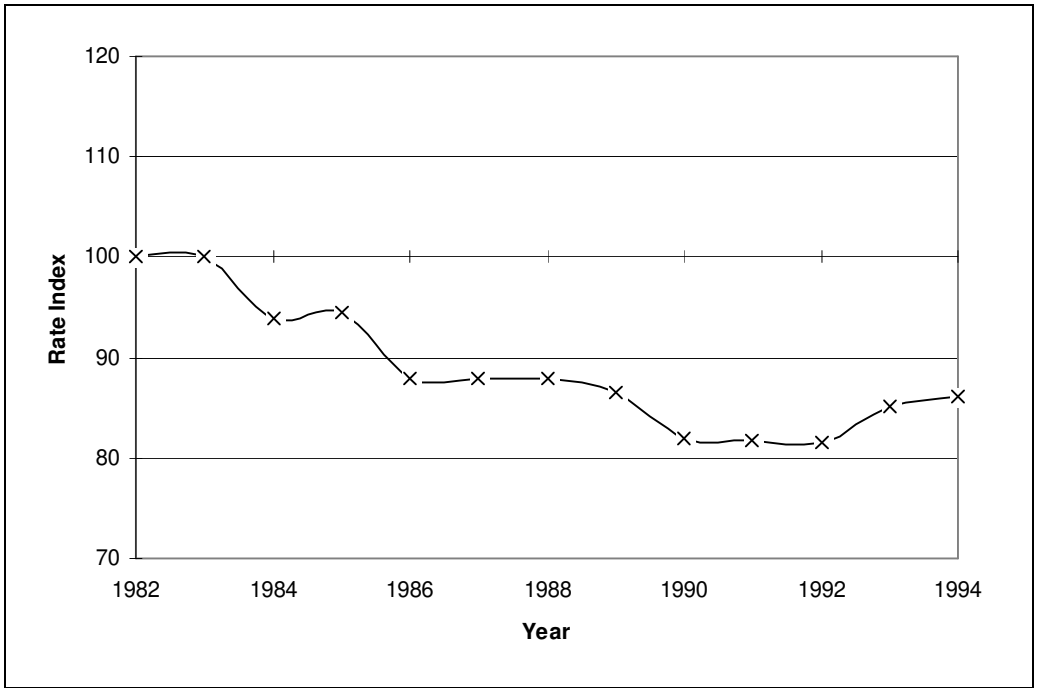
Table 1
Annual Rate of Percent Change For Telecommunication Price Indices

Index	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994[1]
Consumer Price Index	3.9	3.8	1.1	4.4	4.4	4.6	6.1	3.1	2.9	2.7	2.9
CPI All Telephone Services	9.2	4.7	2.7	-1.3	1.3	-0.3	-0.4	3.5	-0.3	1.8	1.7
CPI Local Services	17.2	8.9	7.1	3.3	4.5	0.6	1.0	5.1	0.5	1.0	0.5
CPI Intrastate Toll Services	3.6	0.6	0.3	-3.0	-4.2	-2.6	-2.2	-1.5	-2.4	0.2	-0.4
CPI Interstate Toll Services	-4.3	-3.7	-9.4	-12.4	-4.2	-1.3	-3.7	1.3	-1.3	6.5	7.8

[1] The 1994 CPI changes are measured August through August.
Source: FCC (1994), p. 303.

New services by U.S. carriers are likely to lower the price of incoming international calls. U.S. carriers have introduced international 800 numbers and callback services that allow callers in foreign countries to avoid monopoly prices charged by the local carriers and access U.S. carriers directly, reducing the price of calls originating in foreign countries by 50 to 75 percent.[8] As of 1993, these services made up only a small percen-tage of the international market.

Figure 3
AT&T Rates for International Calls
7 Minute Direct-Dialed Calls



Source: Federal Communications Commission, March 1994, P. 31.

[8] U.S. consumers traveling abroad, rather than foreign nationals, are the primary users of these services.

2.3 Employment

Overall employment in the telecommunications services industry is flat to mildly decreasing. As the Regional Bell Operating Companies have aggressively down-sized, other firms, particularly mobile and enhanced service providers, have been expanding their payrolls.

From 1980 to 1994, total employment in the Wireline Services sector decreased at an annual rate of 2 percent (from roughly one million workers to just under 800 thousand workers). Employment in Telegraph and Other Services declined steadily after 1985. Conversely, certain emerging sectors with relatively small employment bases (e.g., electronic-mail and facsimile services) have expanded. Employment in Wireless sectors also increased.[9]

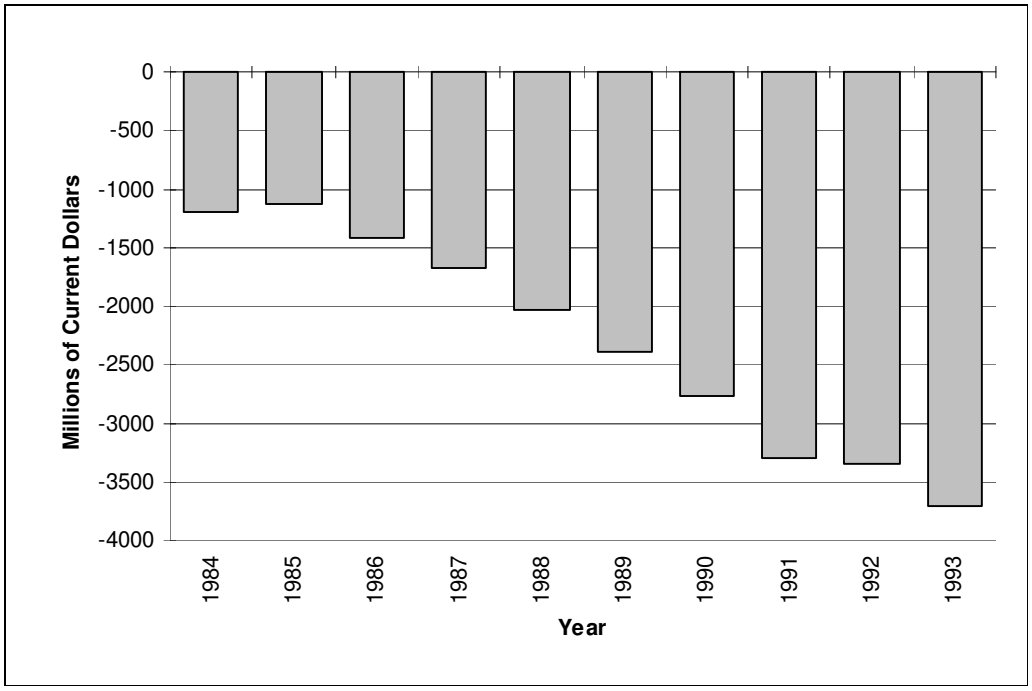
2.4 International Trade

U.S. telecommunications firms cannot provide end-to-end international service. Therefore, they enter operating agreements with their foreign counterparts to complete overseas calls. The originating carrier pays the terminating carrier a settlement payment according to a negotiated rate (known as the accounting rate). The flow of settlement payments determines the trade balance in telecommunications services.

The United States has a trade deficit in telecommunications services. In 1984, the deficit was $1.2 billion. It had increased to $3.7 billion by 1993. (Figure 4.) This deficit is, however, a poor measure of the vitality of the telecommunications services industry. The United States has a large, dynamic, and telecommunication-intensive economy. A greater volume of international calls originate in the United States than abroad. Furthermore, traffic originating in the United States is increasing at a faster rate than traffic originating in foreign countries. Minutes originating in the United States and terminating in a foreign country have grown at an average annual rate of 16.3 percent from 1984 to 1992, while minutes originating in foreign countries have grown at an annual rate of 13.0 percent. The trade deficit reflects the relatively heavy use of telecommunications services for international communication in the United States and historically high foreign rates that have dampened demand for foreign calls to the United States.

[9] Trends based on unpublished Bureau of Labor Statistics data for 1988-1993.

Figure 4
U.S. Net Settlement Payments to Select Foreign Countries



Source: Federal Communications Commission, 1994, p. 207.

2.5 Productivity

Value-added per employee hour in telecommunications services grew at an average annual rate of 6.1 percent between 1982 and 1992. Gross output per wage and salary employee grew at an average annual rate of 6.4 percent over the same period. A 1993 DRI/McGraw-Hill study of the impact of telecommunications infrastructure moder-nization on national and state economies estimates that total factor productivity in telecommunications grew at an average annual rate of 2.4 percent from 1982 to 1991.[10] This growth was faster than for manufacturing (1.0 percent) and for the total economy (0.4 percent).

A 1992 McKinsey Global Institute study comparing the productivity of U.S. telecom-munications services with industries in Germany, Japan, France, and the United Kingdom, found that the United States, Japan, and France were roughly equivalent in labor productivity. Germany and the United Kingdom trailed this group. The United States led the four other countries in capital productivity and total factor productivity. Total factor productivity in the United States was 20 to 50 percentage points higher than in Japan or in the European countries.[11]

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[10] Productivity is an economic efficiency measure of the resources used in the production process. Labor productivity is the value of goods and services in constant prices per hour of labor input. Total factor productivity is the value of goods and services in constant prices per combined unit of labor and capital inputs.

[11] Japan was second in total factor productivity. France was third, followed by the United Kingdom, then Germany. The results of this study must be viewed with caution, because they are subject to the same data problems as the infrastructure studies cited above.

2.6 Links to Other Industries

Telecommunications services are unique because of their use as a key input in other sectors of the economy. DRI/McGraw-Hill reports that telecommunications service inputs to production by U.S. industries increased rapidly between 1965 and 1987. These results may reflect the falling prices of telecommunications services that make these services cheaper relative to other communications services, such as the postal service. They may also imply that telecommunications services have become a more efficient input to production over time.

3. Measures of Competitiveness

It is difficult to make cross country comparisons for measures of infrastructure develop-ment and productivity. Most international data have a long time lag, thus it is difficult to get an accurate picture of the current state of the industry. In addition, types of services vary substantially by country due to geographical and cultural differences.

3.1 Penetration Rates

A traditional measure of the breadth of a country's telecommunications services is the penetration rate; i.e., the number of lines per 100 inhabitants. This measure is, however, becoming less useful for assessing unmet demand as mainlines for fax machines and computer modems proliferate and as wireless services provide an alternative to traditional wireline services. New measures, such as the number of cellular subscribers per 100 inhabitants and the number of telecom access paths per 100 inhabitants, offer more, although still limited, information.[12] Among OECD countries in 1992, the United States was sixth with 56.5 mainlines per 100 inhabitants,[13] fifth with 4.3 cellular subscribers per 100 inhabitants,[14] and seventh with 60.8 telecom access paths per 100 inhabitants (OECD, pp. 40-43).[15]

3.2 Advanced Technology

The technological level of the national telecommunications infrastructure is another measure of national competitive performance. Certain technologies, such as fiber optics cable and digital switching, allow a greater volume of transmissions to travel over a telecommunications network. Digital technology, for example, provides higher quality service with lower maintenance costs and lower long-term costs per line. The greater the percentage of a country's network constructed using advanced technologies, the greater the capacity and efficiency of the network, and thus, the greater the contribution to other sectors of the economy.

In 1992, nearly a million miles of fiber optic cable had been deployed in the United States. This was more than any other OECD country. The OECD reported that 60 percent of the U.S. fixed network (mainlines) was digitally controlled in 1990. This placed the United States eighth among all of the OECD countries (OECD, pp. 44).

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[12] Telecom access paths measures the ability to access the network by combining both mobile and mainline subscribers.

[13] Mainlines per 100 inhabitants: Sweden (68.2); Luxembourg (60.6); Switzerland (60.3); Canada (59.2); Denmark (58.1); the United States (56.2).

[14] Cellular subscribers per 100 inhabitants: Sweden (7.89); Finland (7.14); Norway (6.83); Iceland (6.11); the Unites States (4.33).

[15] Telecom access paths per 100 inhabitants: Sweden (76.1); Switzerland (63.7); Canada (63.3); Denmark (62.1); Finland (61.5); Luxembourg (60.9); the United States (60.8).

3.3 Investment

Several factors make cross-country comparisons of investment measures in telecom-munications difficult. First, countries use different accounting methods for their investments. Second, monopoly prices distort the true investment levels in countries where monopolistic manufacturers control the telecommunications equipment market. Third, comparisons between countries at different levels of telecommunications development often reveal only the developmental differences.[16] Finally, most reported investment data are for public and regulated entities. As telecommunications become more competitive, investment activities move into the private sector and become more difficult to gauge.

OECD analysts suggest that this final consideration may be one reason that the United States and the United Kingdom, the two countries with the longest history of liberalization, have the lowest investment to revenue ratios. In 1992, the United States was also near the bottom of OECD countries in public investment per mainline ($167 in constant 1992 dollars) and public investment per capita ($94 in constant 1992 dollars) and in public telecommunications investment as a percentage of gross fixed capital formation (2.7 percent) (OECD, p. 47).

[16] For example, one standard investment measure is investment divided by revenue. This measure can be difficult to interpret. More developed telecommunications networks have the potential to yield greater revenue because they typically have higher utilization rates. Thus, if two countries invested the same amount of money on telecommunications, the country with the more advanced network would likely have a smaller investment to revenue ratio.

In a 1991 study, the National Telecommunications and Information Administration (NTIA) attempted to get a more accurate picture of U.S. investment by comparing the United States with the Group of Seven countries. The NTIA found that in 1989 the United States made an average annual capital investment per mainline of $218 (constant 1989 dollars). This placed America sixth among the Group of Seven ahead of only the United Kingdom. However, the United States ranked third in its level of annual average investment for modernization, behind Germany and Japan.

Growth rates of U.S. investments in modernization, however, lagged those of the other Group of Seven countries. The United Kingdom (+7 percent) and Germany (+5 percent) led this category. From 1980 to 1989, the United States' average annual growth rate declined 8 percent (NTIA, p. 165). A declining modernization investment growth rate may indicate future weakness in the U.S. telecommunications industry. These comparisons are, however, subject to the same measurement limitations as the other investment measures, which makes these findings far from conclusive.

4. Markets and Trends

The United States is the single largest market for telecommunications services in the world. As measured by revenue, the United States represented approximately one third of the total global market in 1993. The European Union had the next largest market with a 23 percent share. The Asia-Pacific region followed with a 16 percent share. The U.S. market was, however, growing at a slower overall rate than these other two markets. As Table 2 shows, estimated telecommunications revenue growth in the Asia-Pacific region was anticipated to be 15 percent in 1994. Europe and the United States follow with revenue growth rates of 6.9 percent and 7.7 percent.[17]

Table 2
Anticipated Growth in Telecommunications Services Revenue by Region, 1994

(percent)

Sector	United States	Europe	Asia-Pacific
Local and Long Distance	5-6	4-6	4-10
International	20	13	16
Mobile/Cellular Services	39	30	50
Satellite Services	20-30	27	20-30
Enhanced Services	40	20-30	25
All Sectors	7.7	6.9	15

Source: Global Source Reference, cited in Olbeter and Chimerine, p. 6.

In 1993, the United States represented approximately 32 percent of the global basic voice market, 25 percent of the satellite market, and 40 percent of the Enhanced Services and the Mobile/Cellular markets. Except for Enhanced Services, a segment of the Telegraph and Other Services sector, anticipated 1994 revenue growth rates were generally higher abroad than in the United States. For example, Mobile/Cellular services were forecast to increase 50 percent between 1993 and 1994 in the Asia-Pacific region, while only increasing by 39 percent in the United States. Although the United States has a large and expanding market for telecommunications services, opportunities for U.S. telecommunications firms are growing faster in country-to-country services and in the domestic markets of foreign countries.

[17] Less developed regions may exhibit high growth rates in part because their existing telecommunications infrastructures are underdeveloped and they are attempting to "catch-up."

The development of overseas telecommunications markets is driven by rapid demand growth in foreign countries and by large telecommunications customers looking for uniform global accessibility. These factors have induced telecommunications firms to move toward integrated global networks through carrier partnerships. Large multi-national firms such as AT&T, British Telecommunications, and Japan's Kokusai Denshin Denwa (KDD) have begun to serve this market by offering global services through agreements, consortia, and alliances with other telecommunications firms.

III. FORCES SHAPING THE INDUSTRY

1. Deregulation of the U.S. Telecommunications Industry

Prior to the 1984 divestiture, AT&T dominated U.S. domestic telecommunications services and the telecommunications equipment manufacturing sector. Originally, the government considered AT&T a natural monopoly providing a public good and permitted AT&T to enjoy a *de facto* monopoly in the geographic areas that it served.[18] AT&T's profits were, however, subject to rate-of-return regulation,[19] which grew out of the 1913 agreement between AT&T and the Department of Justice. The Communications Act of 1934 later codified these regulations.

Between the 1950s and 1982, a series of court cases whittled away AT&T's monopolistic structure, enabling subscribers to attach devices to their telephones and telephone lines and opening the way for private transmission facilities and private networks. In 1974, the Department of Justice filed an antitrust suit charging that AT&T had used its monopoly control of local exchange to impede competitive entry into the long-distance market. Eight years later, U.S. District Judge Harold H. Greene issued a consent decree, known as the Modification of Final Judgment (MFJ), ordering AT&T to divest itself of companies providing local exchange service. The Bell Operating Companies were consolidated into seven regional holding companies (RBHCs), which are currently regulated by state public service commissions and by the FCC.

The FCC also encouraged the development of competition in the long-distance market by applying dominant carrier status to AT&T.[20] This allowed the FCC to monitor AT&T's actions and ensured that AT&T did not abuse its dominant market position to disadvantage new entrants.

During the summer of 1995, both the U.S. Senate and House of Representatives passed bills that have the potential to make sweeping changes to existing telecom-munications, broadcast and cable television regulations. Table 3 compares the telecommunications services provisions of the two bills. The Clinton Administration has expressed support for telecommunications reform, but criticized specific provisions in both bills. The prospects for revision of telecommunications law in the near term are unclear.

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[18] The cost of building and maintaining a telecommunications network was considered so high that it represented a formidable barrier to entry into the market even if the cost of providing the service was minimal. Moreover, there were economies of scale and scope, such that a single large firm could operate with greater efficiency than multiple smaller firms. As a public good, telecommunications services were assumed to provide economic and social benefits to the public that could not be captured by the price of those services to consumers.

[19] Rate-of-return regulation limited the amount of profit that a firm could make to a specific range. This regulation was abandoned by the FCC in 1989 in favor of price ceilings.

[20] Firms with dominant carrier status are subject to more stringent regulations (e.g., they submit traffic, revenue, and tariff data more frequently, and must request permission for network expansion) than firms without the classification.

In addition to the pending legislation, the Justice Department's Antitrust Division continues to play a role in regulating the telecommunications services industry. The Division has announced plans to recommend to Judge Greene, who continues to oversee the MFJ, that he allow Ameritech, a RBHC, to sell long distance services to its customers on a trial basis. Judge Greene has also recently ruled that Bell Atlantic can provide long distance and data services to its wireless customers.

2. International Barriers to Competition

2.1 Accounting Rates

The absence of competition in the foreign telecommunications markets gives U.S. telecommunications firms very little control over accounting rates, the negotiated rate of sharing revenue for jointly handled international calls. Monopolistic foreign carriers are able to demand above-cost rates, which reduces net revenues for U.S.

Table 3
Comparison of House and Senate Bill Provisions
Relating to Telecommunications Services

	S 652	HR 1555
Local Telephone Competition	Would require local telephone companies to negotiate agreements for sharing their networks with would be competitors, providing access to individual elements of the network at reasonable prices. If no agreement was reached within 160 days, the state or the Federal Communications Commission (FCC) could intervene to impose a settlement. States or the FCC also could waive the network-sharing requirements for small telephone companies in rural areas.	Would require local telephone companies within six months to share their networks with would be competitors, providing access to individual network elements and services at wholesale prices for resale. States could waive the requirements for rural telephone companies, and small companies would be exempt unless state regulators ruled otherwise. The requirements would end for any company in the market that became competitive.
Bell Entry into Long Distance	Would prevent a Bell from entering long-distance in any market until it met the bill's network-sharing requirements and implemented them with a competitor. The FCC advised by the Justice Department, also would have to find that letting the Bell into long-distance would be in the public interest. The Bell would have to establish a separate subsidiary to offer the service.	Would prevent a Bell from offering long-distance service in a state until it met the bill's network-sharing requirements as determined by the FCC in consultation with the Justice Department. Also, a competitor would have to be offering service to both residential and business customers in at least one community in that state, using its own equipment for the most part. A separate subsidiary would be required only for 18 months.
Indecent Telecommunications	Would make it unlawful to use electronic mail, a fax machine or other telecommunications device to harass another person with obscene, lewd or indecent material. The bill would also outlaw sending "obscene" material to anyone, or "indecent" material to minors, via computers. The maximum penalty would be a fine of $100,000 and a two-year prison term.	Would make it a federal crime to transmit "indecent" material to minors over computers, and clarify that federal laws against the distribution of "obscene material applied to computers. Operators of computer networks could restrict access to material they considered objectionable without assuming legal responsibility for the information put on the network by its users. The bill would also have the Justice Department study the issue.

Source: *Congressional Quarterly*, August 1995, p. 2351.

carriers, subsidizes foreign carriers, and depresses demand for international telecommunications services.[21] Although accounting rates have decreased on average by 3 percent a year for the last few years, the Economic Strategy Institute estimates that the rates in 1992 were 30 percent above cost (Olbeter and Chimerine, p. 57). In addition, many foreign countries discriminate against U.S. operators by demanding higher accounting rates from U.S. firms than they do from non-U.S. foreign firms. Accounting rates represent roughly two-thirds of the price of an international call to the consumer. Lower rates would decrease prices and increase demand for international telecommunications services.

[21] The FCC, in 1991, cited evidence that U.S. carriers were making over payment in the order of $500 million per year and that foreign governments used this revenue to subsidize local telephone service and other governmental services, such as postal systems.

2.2 Other Trade Barriers

New Zealand, Sweden, and the United Kingdom are the only countries that allow market access to foreign firms comparable to the access granted in the United States. In 1998, the European Union plans to permit competition. Most foreign countries deny outside firms access to their basic voice services markets. The few countries that have liberalized their basic voice telecommunications markets have not developed policies encouraging increased competition. Even when markets are privatized and opened to competition, many countries enact laws that favor the dominant public telephone operators. In contrast, U.S. firms face fewer restrictions in providing mobile communications services. (Table 4.)

Restrictions on foreign participation typically take the following forms: 1) quantitative restrictions on the number of firms that can participate in the domestic telecommunications market; 2) limits on the foreign ownership of telecommunications services firms; 3) regulations that apply only to foreign operators or allow dominant domestic firms to thwart the entry of foreign firms.

3. Technology

As previously mentioned, the technology used in a telecommunications infrastructure determines the range of services that carriers can offer. Technological advances can greatly increase the type and number of available services. For example, recently introduced Advanced Intelligent Network (AIN) technologies have expanded the services offered in local exchange markets. AIN technology decouples the service logic from the switches for wireline networks.[22] Before AIN, the electronic switches contained the routing information for the entire network. Changes in the service logic to offer a new service meant reprogramming switches across the network.[23] By separating the two technologies, AIN made it possible to change the routing of calls without making universal programming changes on the network.

[22] The service logic is the portion of the switch that contains the information on how calls should be routed.

[23] The computer programs that control network switches are long and complex. Errors in these programs have the potential to shut down the entire network, thus the risks associated with programming changes, prior to AIN, were very high.

Table 4
Telecommunications Market Structure:
Foreign Countries Compared with the United States

Country	Basic Voice Local	Long Distance & International	Mobile/ Cellular	Telegraph and Other
Australia	Duopoly Closed to For. Firms	Duopoly Closed to For. Firms	Three Firms Licensed Two For. Firm	Open / Competitive
China	Monopoly	Monopoly	Monopoly	Closed to For. Firms
France	Monopoly	Monopoly	Duopoly: For. Firms in One Carrier	Open / Competitive
Germany	Monopoly	Monopoly	Duopoly: For. Consortia in one carrier	Open / Competitive
Italy	Monopoly	Monopoly	Duopoly Closed to For. Firms	Open / Competitive
Japan	Managed Competition Closed to For. Firms	Managed Competition Closed to For. Firms	Regional Competition For. Firm Participation Minimized	Open / Competitive
Malaysia	Monopoly	Managed Competition	Regulated Duopoly For. Firms in New Carrier	Competitive Closed to For. Firms
New Zealand	Open / Competitive	Open / Competitive	Open / Competitive	Open / Competitive
South Korea	Monopoly	Monopoly	Regulated Duopoly Limited For. Participation	Open / Competitive
Sweden	Monopoly	Open / Competitive	Analog Monopoly Digital Competition	Open / Competitive
U. K.	Open / Competitive	Open / Competitive	Multiple Licenses Open to For. Firms	Open / Competitive
U.S.	Competition in Some States	Open / Competitive	Regional Duopoly Limited For. Participation	Open / Competitive

For.=Foreign.
Source: Economic Strategy Institute, 1994.
Updated for 1995 by Stephanie McMullough of the International Trade Administration, U.S. Department of Commerce.

AIN reduces the costs of deploying new services by enabling carriers to deploy them more rapidly and test them with prototypes and trials before introducing them over the entire network. AIN also expands the variety of services carriers can offer. New services include least-cost routing, security and access restrictions, single number services, voice mail, automated call distribution, automated customer name and address, calling name delivery, customer intercept, call completion, keep-trying services, outgoing call screening, personal communications services, and a variety of others (Bastian, Clark and Webber, pp. 3-7 and Pelorus Group, pp. 1-32).

Technological advances in communications and network technology can also affect industrial structure by determining the optimal size of telecommunications carriers. For example, microwave communications technology, introduced in the 1950s, had a smaller optimal scale than the existing

wireline technologies. Thus, microwave technology enabled more than one firm to profitably compete in long distance markets and eventually led to the breakup of the long distance monopoly in the United States. Advances in wireline technologies are on the verge of creating a similar structural change. They have enabled television providers to potentially offer telecommunications services over cable television networks. If regulators allow cable television companies to provide telecommunication services, it will introduce greater competition into U.S. local exchange markets.

4. Competition

Although, basic local service in the United States is still a monopoly for most consumers, deregulation has created intense competition in much of the U.S. telecommunications market. Pending legislation would continue this process by restructuring local and long distance markets. Competitive access providers such as Teleport and Metropolitan Fiber have already begun to enter local markets to service business users who have specialized needs and large volumes of telecommunications traffic. Traditional long-distance providers are also planning to compete in the local markets using wireless technologies to deliver wireless personal communications services. Recently, three Bell-company cellular carriers plus AirTouch Commun-ications, Pacific Telesis Group's cellular spin-off, banded together to offer Personal Communications Services. In addition, Sprint formed alliances with cable-TV giants Telecommunications Inc., Cox, and Comcast to bid for Personal Communications Services licenses and provide local phone service. AT&T acquired McCaw Cellular Communications to compete in the same market.

In the U.S. long-distance and international service markets, U.S. firms face increasing competition from foreign service providers. Nearly 500 domestic and foreign firms participated in the U.S. long-distance market in 1993. Cable & Wireless (UK) is the fifth largest carrier. Mobile and enhanced services are similarly open and competitive in the United States and availability of these services will most likely expand as a result of the 1995 FCC auctions of Personal Communications Services spectrum licenses.

As technological changes allow telecommunications carriers to transmit a broader range of transmission (from voice to video), carriers are becoming increasingly involved in the content of the communications being transmitted over their networks. Telecom-munications carriers are forming alliances with companies in the entertainment and information industries to take advantage of the potentially lucrative markets for entertainment and multimedia services. One example of this phenomenon is NYNEX which has developed partnerships with Viacom, Blockbuster, and Paramount for entertainment services; Dow Jones for business information services; Citibank and Phillips for home banking services; Prodigy for computer interactive services; and the New York Times for home faxing services.

4.1 Sophisticated Consumers

The United States, as noted above, is the largest market in the world for telecommunications services. It also has relatively broad telecommunications coverage, as measured by penetration rates. These factors combined with the increasingly competitive domestic market have created a base of sophisticated consumers whose demands have helped develop U.S. competitive advantage in telecommunications services.

4.2 Benefits of a Competitive Environment: The Example of Cellular Communications

Cellular telephone services is one of the most internationally competitive segments of the U.S. telecommunications services industry. A 1993 U.S. International Trade Commission (ITC) study suggests that firms compete for foreign license awards principally in terms of technical ability, marketing skills, and cost management skills. These skills are typically developed through aggressive competition in domestic markets. For example, the principal costs for cellular service providers are infrastructure equipment

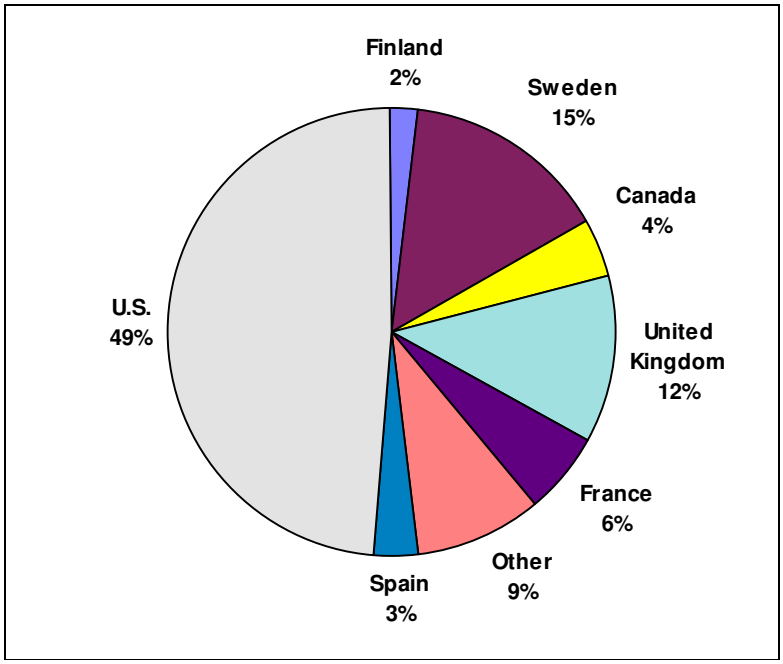
expenditures, operating expenses, cell-site maintenance costs, and marketing costs. Marketing costs are the single largest variable cost and cellular service providers have focused on reducing marketing expenditures to enhance their domestic competitive positions. Cellular service providers that have faced intense price competition in their home markets appear to have the most advanced cost management skills (ITC, pp. 3:1-37).

Superior cost management skills give U.S. firms an advantage in finding foreign partners. Many foreign firms have little or no experience in managing the costs associated with communications networks, thus they seek partners with those skills. Consortia that can draw on the cost management skills of their members are also more likely to win foreign cellular service licenses since licensing agencies typically require that a firm's business plans identify how cellular service prices will be reduced over time.

Firms facing stiff competition and consumer demand for a better product have learned to improve caller mobility, call quality, and call features in their home market. Consequently, U.S. firms have developed superior technical skills, such as the network configuration and software writing skills necessary to provide new and advanced services.

These skills have paid-off in international competitiveness as measured by the worldwide share of cellular phone licenses awarded to foreign firms by home countries. U.S. firms have dominated competition in this market, winning 49 percent of all licenses awarded to foreign firms in 1993. Sweden was second with 15 percent of the cellular service awards and the United Kingdom was third with 12 percent. (Figure 5.)

Figure 5
Share of All Cellular Licenses Awarded to Foreign Firms



Source: International Trade Commission, 1993.

IV. EVOLVING MARKETS

1. New Telecommunications Services in Business and Manufacturing

Telecommunications services applications in manufacturing have the potential to transform and improve all stages of manufacturing operations. The ability to quickly and efficiently transfer data within and among operations can revolutionize the design process, enabling collaboration and communication among suppliers, partners, customers, and competitors at distributed locations. Using advanced databases and other services, manufactures can rapidly distribute requirements and specifications for materials allowing the most qualified and competitive suppliers to respond without regard to the firm's size or location. Telecommunications technology also allows individuals to telecommute to work. Evidence suggests that flexible work place arrangements can help organizations recruit and retain key personnel, improve office productivity, increase use of new technology, and reduce facilities costs.

2. New Telecommunications Services in Banking[24]

Innovations in telecommunications services are enabling banks to deliver products and services to their customers faster, more conveniently, and at a lower cost. At the same time, innovations in telecommunications are forcing banks to eliminate traditional brick and mortar branch networks and to redesign product offerings for new and emerging markets.

2.1 Importance of Branchless Banking

Bank branches continue to fill a role in bank services delivery but they are no longer the most important channel due in large part to the development of services based on telecommunications networks. The alternatives to branch banking most used today are the telephone and automated teller machines (ATMs). Recent studies have shown that approximately 45 percent of the U.S. population now has access to some kind of phone-based banking and that almost 60 percent of those with access to the service use it. Also, just over half of households use ATMs at least once per month. Driving this trend is the fact that non-branch transactions are both more convenient and much cheaper. Ernst & Young estimates that the average teller transaction in the United States costs a bank over $1. The same transaction costs 35 cents by phone and just 27 cents on an ATM. Cost on the Internet is projected to be in the 1 to 2 cents range.

2.2 Digital Cash[25]

Ranked as one of the '10 Hottest Technologies' in telecommunications for 1995 (Flanagan, pp. 31-41), digital cash will lead to significant changes in the development of the payment system and, therefore, the strategic position and operation of banks. Digital cash is essentially software money. It can be stored value, like the so-called smart card. Visa International, MasterCard International and Europay International S.A. were to release industry standards in June 1995 for smart cards. IBM, NCR Corp., Motorola, Inc. and GemPlus International, Inc. are building the hardware and software components to support some forms of digital cash.

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[24] Christopher L. Whaling of the Technology Administration, U.S. Department of Commerce contributed the banking section.

[25] Digital cash is one popular term for money in an electronic form that may be used for monetary transactions over telecommunications networks.

The fact that non-bank providers of digital cash could be the consumer's first contact when they want to obtain money opens the possibility that banks may lose more of their consumer financial services to these non-bank providers operating over the telecommunications networks.

2.3 Banks, Telecommunication Companies, and Electronic Commerce

Given secure on-line payment mechanisms, banks and telecommunication companies are positioning themselves for on-line commercial services. Instead of acquiring more branches, banks find that they can reach old and new customers through computer networking at far less expense. To deliver value-added products to markets faster and cheaper, however, banks are turning to third-party technology partners whose expertise is in providing the interactive telecommunications link to customers.

One large bank has outsourced, on a trial basis, its live operator function for both customer service and telemarketing to MCI's newly created Integrated Client Services Division. In February 1995, Wells Fargo became the first U.S. bank to provide a secure system for credit-card purchases over the Internet. It established a joint venture with on-line wine retailer Virtual Vineyards and used CyberCash, Inc.'s secure electronic payments software. Finally, Cardinal Bankshares Inc., a $607 million Lexington, KY bank, recently formed a subsidiary, Security First Network Bank, designed to be one of the first full-service interactive banks on the Internet. Cardinal uses a secured UNIX server from Atlanta-based SecureWare along with public-key encryption software.

3. New Telecommunications Services in Health Care

Telecommunications service applications have the potential to cut unnecessary medical costs and to improve health care access and quality. National telecommunications networks will enable private citizens and health care providers to access the most recent information about medical technologies, clinical treatments, and provider performance. Patient information can be linked to medical treatment data so doctors and researchers can better understand the most appropriate medical procedures for each patient.

Among the potentially most powerful medical telecommunications services is interactive video using two-way voice and video systems. It will enable doctors to examine patients from remote locations, facilitate doctor-to-doctor consultation, improve the training of health care professionals, and enhance the quality of medical care available to communities with few medical resources.

Telecommunications services will simplify and speed up administrative processes within the health system by eliminating paperwork duplication and standardizing the data definitions required to make health care claims. Administrators may be able to make electronic claims and receive payments over the national networks, further reducing administrative costs.

Telemedicine is already in use in both private and public sector medical facilities. Bell Atlantic and Oracle Corporation are teaming up with Kaiser Permanente Health Plan to provide multimedia services to examining rooms and patient homes. Michigan State University's Center for Applied Medical Informatics uses a network that allows physicians and residents to share patient data from locations in six regions around the state. In early 1994, Ameritech demonstrated a system that enables the family of a person with a serious chronic illness to access medication at regular intervals and to obtain direct consultation with a physician via personal computer and television cameras.

The Department of Veteran Affairs uses a hospital information system that employs digital telecommunications technology. Veteran Affairs is currently enhancing its telecommunications systems to allow VA health care facilities to exchange health summaries and clinical data across a network. At Washington, D.C. and Baltimore medical centers, the VA has installed an imaging project to integrate medical images into the electronic patient record.

4. New Telecommunications Services in Education

New telecommunications services will transform education, and training by making new tools available to administrators, instructors, and students. Teachers and students will have access to instructional resources and to each other through networks that permit them to communicate with scientists, scholars and experts around the globe.

There are examples of telecommunications services being used in education throughout the United States. Pacific Bell has committed to providing data links for all California schools, colleges, and universities. The Texas Education Network allows teachers to share information, exchange electronic mail, and locate information via a telecom-munications network. Bellcore and Northwestern University have created Collaborative Visualization, which allows students at remote locations to communicate with university researchers and other experts on environmental issues.

Federal agencies also support telecommunications services that provide informational and educational materials. The Department of Commerce's STAT-USA office provides economic news and data through computer bulletin boards and through the Internet. The Department of Agriculture collaborates with land grant colleges and universities to make an array of information and expertise available on-line and to provide distance learning opportunities for urban and rural communities.

5. New Geographic Markets

Changing political situations worldwide have opened markets in regions that need to construct basic telecommunications infrastructures. For example, countries in Latin America, Eastern Europe, and the Commonwealth of Independent States have underdeveloped telecommunications infrastructures and are seeking to improve them. These markets are usually heavily regulated and monopolistic in structure. Although some countries have deregulated portions of their telecommunications industries, U.S. firms have been unable to enter and compete in many of these markets. They have been more successful in providing wireless services, primarily to the developing markets in South and Central America and Central and Eastern Europe. In some cases, these countries are skipping over building the traditional wireline infrastructures and moving directly into wireless services.

Europe

The European telecommunications services market is characterized by state owned monopoly operators and limited foreign competition. A 1993 study conducted by the U.S. Office of Technology Assessment concluded that 85 percent of the European Union's (EU) telecommunications services market remained closed to foreign firms (OTA, p. 5). Most European countries restrict foreign firm access to the basic services market by preserving government-owned monopolies in local, long-distance, and international voice telecommunications services. In mobile communications, most European countries maintain regulated duopolies. Several countries, Spain, Ireland, and Switzerland, maintain monopolies in mobile communications. The United Kingdom, Sweden, and Finland are the only European countries that allow competition in portions of their telecommunications services market.

U.S. firms have substantial investments in the United Kingdom.[26] U.S. firms are also participating in several international cellular communications ventures in Central and Eastern Europe and Commonwealth of Independent States where governments have allowed foreign mobile communications firms to bid for

[26] Both Sprint and AT&T have been licensed to provide nationwide basic telecommunications services, and the RBHCs and U.S. cable companies have been particularly aggressive in the British cable and local telephony market. NYNEX, U.S. West, TCI, Pacific Telesis, Southwestern Bell, and Cox Cable all have substantial holdings in the United Kingdom cable telco market.

national cellular and paging licenses. In the basic service markets of Central and Eastern Europe, U.S. presence is small, but expected to grow significantly in the future.

Asia-Pacific and Latin America

U.S. firms face significant barriers in the telecommunications services markets of most Asian countries. Thailand and Indonesia provide some opportunity in the paging and cellular industries. Motorola and McCaw both recently have developed stakes in Hong Kong's cellular market. U.S. firms have had mixed success in the Japanese telecommunications services markets. Currently U.S. firms hold a 23 percent stake in Japanese cellular ventures. U.S. firms are limited to investments in Japanese carriers.

Australia recently licensed the first foreign firm to compete in its cellular market. U.S. firms have entered aggressively into New Zealand.[27] They are also active in both the basic service operations and cellular markets of South and Central America. Mexico has been the focal point of U.S. foreign investment because its long-distance markets are scheduled to open in 1997.

Trends in U.S. Telecommunications Investment Abroad

RBHC penetration in foreign markets has increased rapidly over the past few years. The RBHCs now own and operate foreign ventures ranging from cellular and Personal Communications Services to basic wireline services in Europe, Latin America, Asia, and New Zealand.

Long-distance firms are also pursuing overseas operations. AT&T announced a goal of drawing 50 percent of the firm's revenues from overseas operations by the year 2000. AT&T formed World Partners, a loose coalition of carriers offering corporate customers compatible data and voice services. Other members include KDD, Singapore Telecom, Telecom New Zealand, Australia's Telstra, Hong Kong Telecom, and Unisource, an alliance of Scandinavian phone companies. In addition, AT&T has announced an agreement to operate joint telephone networks in parts of the former Soviet Union.

MCI and Sprint are both actively seeking to enter cellular and basic telephone markets in Asia, South and Central America, and Central and Eastern Europe. MCI and British Telecommunications formed the first transatlantic telecommunications agreement by establishing Concert, a billion-dollar joint venture. In addition, MCI and several foreign carriers are partners in a venture called the Financial Network Association, which plans to offer specialized communications services.

5.1 Foreign Deregulation

The EU has established a January 1, 1998 deadline for member states to allow resale and facilities-based competition in their basic voice services markets. In June 1995, the European Commission issued a directive that requires EU member states to eliminate mobile communications monopolies.

Several Asian-Pacific countries have also established plans for liberalizing their telecommunications services markets. The most common deregulation plan excludes foreign firms as long as possible to promote domestic industries and insulate inefficient monopoly operators. Most foreign countries maintain that they keep their telecommunications markets closed for national security reasons.

CONCLUSIONS

Telecommunications is changing the way business is conducted in areas such as manufacturing, banking, healthcare, and education. Firms have used telecommu-nications services to flatten their management

[27] Bell Atlantic and Ameritech own 49.9 percent of Telecom New Zealand, the dominant carrier in New Zealand.

structures and eliminate many labor-intensive activities. Telecommunications services in manufacturing are trans-forming manufacturing operations and revolutionizing design processes and producer-supplier relationships. Telecommunications services are enabling banks to increase efficiency by eliminating traditional branch networks. They have the potential to cut unnecessary medical costs and to improve healthcare quality and access. Similarly telecommunications is changing education by increasing access to information and offering new educational techniques.

Telecommunications services are a vital component of the U.S. economy that has increased in efficiency and productivity, during the past few decades. The U.S. telecommunications infrastructure is among the most advanced in the world. In terms of total factor productivity, the U.S. industry is the most productive. Productivity growth in telecommunications services stems, in large part, from domestic competition and strong demand, which spurs innovation and enables many firms to develop competitive advantages in their fields.

The United States has a large and growing market for telecommunications services. Foreign markets are also growing rapidly. Political changes have enabled many countries with underdeveloped telecommunications infrastructures to seek international assistance in improving their domestic telecommunications services. In addition, Telecommunications services have become more global as country-to-country telecommunications traffic increases. Multinational firms play a role in this globalization process by demanding more uniform telecommunications service among countries. These changes have created potential investment opportunities for firms with skills and experience in the provision of telecommunications services. U.S. telecom-munications services carriers are positioned to provide many of these global services.

In some sectors of the market, such as cellular service, U.S. competitive advantage has, to an extent, been exercised and U.S. carriers have expanded internationally. In the provision of other services, such as traditional wireline services, U.S. firms have been unable to offer their skills and experience in growing foreign markets. Monopolistic telecommunications industry structures in foreign countries and other trade barriers (e.g., above-cost accounting rates) hinder their ability to enter and/or compete to their fullest ability in these markets.

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