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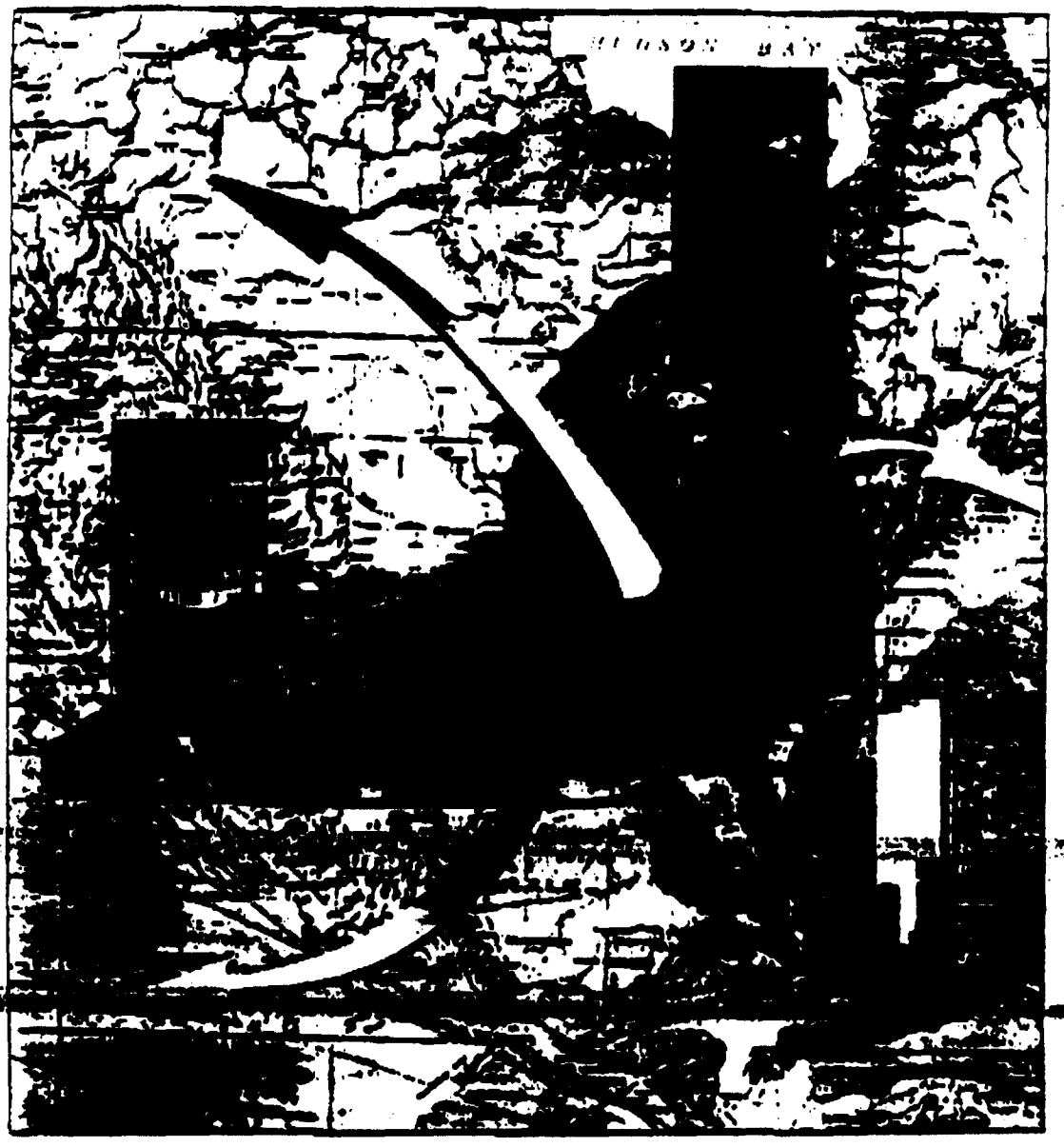

THE REPORT OF THE NEW YORK TELECOMMUNICATIONS EXCHANGE
John J. Phelan, Jr. Chairman

STATE OF NEW YORK
Mario M. Cuomo. Governor

OFFICE OF ECONOMIC DEVELOPMENT
Vincent Tese, Director

DEPARTMENT OF PUBLIC SERVICE
Peter A. Bradford. Chairman

CONNECTING TO THE FUTURE

GREATER ACCESS, SERVICES, AND COMPETITION IN TELECOMMUNICATIONS

The Report of New York's Telecommunications Exchange

December 1993

Edited by Lee Smith and Lisa Rosenblum

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Acknowledgments

by John J. Phelan, Jr.

During this past year, the 37-member Telecommunications Exchange has worked hard to reach a consensus in an arena know for contentious debates between vested interests. This report is a tribute to the tenacity, creativity, and openness displayed by these Exchange members. The Exchange process has proven to be a valuable way of seizing one of the great economic and social opportunities of our times.

The report expresses the views of the Exchange and contains their recommendations to Governor Cuomo. Not every member agrees with every work, phrase, idea, or recommendation. Separate statements by individual members are included as an appendix.

Although the Exchange benefited from the efforts of all of its members and outside experts, it was especially helped by the co-chairs of the individual task forces: Telecommunications-Based and Related Industry—John Compitello and Robert Zinnecker; Technology Diffusion—Deborah Buck and Wilhelmina Reuben Cooke; Infrastructure Technology, and Investment—Brian P. Davia and Rodney Nichols; Regulatory Options—Mitchell L. Moss and William Squadron; Public-Sector Applications—Robert B. Adams and D. Bruce Johnstone.

The Exchange expresses its appreciation to Governor Cuomo for forming the Telecommunications Exchange. The governor asked the members for their best ideas. Throughout the process he and Lieutenant Governor Stan Lundine have remained keenly interested and supportive of our independence.

The Exchange also wishes to express its gratitude to Vincent Tese and Peter Bradford for their support of this project. In particular, appreciation is owed to Lee Smith and Lisa Rosenblum for directing their staffs in a long and productive collaboration, for editing the report, and for mediating the process of consensus forming. Dick Stannard provided invaluable assistance to the Exchange by sharing his vast technical expertise and understanding of telecommunication regulation. All of the members appreciate the work of the Exchange's director, Jay Yablon, for organizing and [illegible]

Finally, particular mention is due to staff members Marty Kohli, Carl Johnson, Rhon Bainman, John Berry, Suzy Im, and Loretta Mock for their extraordinary effort developing and delivering the final report under a tight schedule and for the efforts of Vincent Thomas, Michael Corso, Ed Colchado, and Jeffrey Hoagg throughout the life of the Exchange.

John J. Phelan, Jr.
Chair of the Exchange
December 1993

About the Exchange and Its Members

"New York's economic competitiveness requires a strong infrastructure of roads, rails, bridges and now, in the information age, telecommunications infrastructure. We must assure that our State remains in the forefront of telecommunications technology both nationally and globally. We must do everything possible to encourage telephone companies to modernize the telecommunications infrastructure. New York's policies must be reviewed to ensure that they support the development of the State's critical telecommunications infrastructure, so necessary in this era of high technology.

To take stronger, quicker steps to accelerate the deployment of new telecommunications technologies throughout the State, I am asking Vincent Tese, and Public Service Commission Chair Peter Bradford, to develop the 'Telecommunications Exchange' which will guide the modernization of telecommunications infrastructure and services in New York State—one of our most important infrastructure investments for the next century."

Governor Mario M. Cuomo
Message to the Legislature
January 8, 1992

Governor Mario M. Cuomo established the Telecommunications Exchange to bring policymakers together with industry, users, and other interested groups to develop and recommend a state strategy for telecommunications. The Exchange is a joint undertaking of the Department of Economic Development and the Department of Public Service, under the guidance of Vincent Tese, State Director of Economic Development, and Peter Bradford, Chairman of the Public Service Commission.

The Exchange has spent the past year exploring how telecommunications can be employed to strengthen New York's competitive position in the global economy and foster economic development, and to enhance the quality of life and expand opportunity for all New Yorkers. To facilitate development of this report, the Exchange was established with five task forces working in the following areas:

- Telecommunications-Based and Related Industry
- Technology Diffusion
- Infrastructure, Technology, and Investment
- Regulatory Options
- Public-Sector Applications

The Exchange also sponsored the Governor's Telecommunications Conference on Wednesday and Thursday, June 16-17, 1993, at the Empire State Plaza Convention Center in Albany, NY. This conference, which was attended by more than 600 people, was used to gain input and support from

a wider audience for the work of the Exchange, and to initiate production of this final report from the Exchange to the Governor.

While the Department of Public Service has assisted in the formulation and workings of the Exchange, as well as the drafting of this report, Public Service Commission decisions must, by law, be based on the record and the statutes applicable to proceedings before that body. The positions set forth in this report are the positions of the Exchange and do not represent the Public Service Commission or any of its members with regard to Public Service Commission proceedings.

This report presents the Exchange's findings and recommendations to the governor.

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x

Executive Summary

Modern telecommunications enhances everyone's life. We can reach out to a wider circle of friends in less time and in different ways. We can be better educated, better informed, more productive, and more diversely entertained than a generation or even a decade ago.

The pace of telecommunications advance is accelerating dramatically. Pictures, voices, and information can now be carried anywhere in the state or the nation instantly over wire, over glass fiber, or through the air. Two industries that were once monopolies—telephone and cable television—are converging, becoming competitors or collaborators, and confronting new competitors. No one can foresee the technologies or the companies that will prevail. The quest of the Telecommunications Exchange has been for sound principles for New York, not for the gift of prophecy.

In the Exchange's view, telecommunications is an increasingly important economic and social infrastructure for New York. The new telecommunication technologies will shape our future as much as railroads, telephones, electricity, airplanes, and automobiles have shaped the last century. Properly used, they can improve the quality of our lives and spur economic growth. Nowhere is this more true than in New York, for our state is home to what may be the world's greatest concentration of telecommunications-intensive economic activities.

The Exchange believes that optimal growth and deployment of telecommunications in New York will be obtained primarily through competitive private investment, not by governmental planning. The major challenge faced by the Exchange was to maximize the social and economic benefits of the new, more competitive telecommunications environment. Part of the answer is to preserve and extend some of the positive results of the old, regulated monopoly system, such as universal access to basic service. Another part is to expand and continually upgrade New York's telecommunications infrastructure through market-driven investment. And we need to maximize the benefits of advanced telecommunications by diffusing the technology and its applications to schools, hospitals, and government, to rural and inner-city residents, to persons with disabilities, to minority- and women-owned businesses, to community-based organizations, and to the small and medium-size companies that often lack the resources or expertise to most effectively use the new services and technologies.

For these objectives to be achieved, our state's telecommunication policies must, in the Exchange's view, be guided by the following goals:

[illegible] telecommunications system must remain the best in the world. Businesses must have access on competitive terms to the services, speed, and reliability to keep them ahead. New York policymakers must continue to view an effective telecommunications infrastructure as vital to robust economic growth and job creation.

2. *Provide quality service.* Service quality is a broad concept that necessarily changes with technological advances and evolving standards. Standards are essential to ensure reliability and disaster resistance, and to maintain privacy and other consumer protections. New York is strongly committed to universal service, high service quality, avoidance of rate shock, privacy protection, and maintenance of a forum to resolve consumer concerns.

3. *Promote social inclusion and universal service.* The advances in the communications industry must be used to narrow—not to widen—the distances between us. No New Yorker wanting to communicate with others should be unable to do so because of lack of money or because of illness or disability. Telecommunications polices must recognize, and address, the needs of special groups, such as the economically disadvantaged, minorities, foreign language speakers, rural users, the elderly, and persons with disabilities.

4. *Rely on a competitive market to ensure the best telecommunications decisions for most purposes.* Competition will stimulate modernization and innovation, allow for greater choice and foster higher service quality for users. Governmental modification of investment decisions should be confined to the carefully delineated circumstances described below. Neither regulation nor taxation should cause competitive inequality.

5. *Enhance the quality of life for all New Yorkers.* Modern telecommunications should make New York a more desirable place to live, in part by enhancing the efficacy of our educational system and the provision of healthcare. All New Yorkers should have the opportunity to master the skills they need to participate in our technologically advanced society.

6. *Foster innovation to bring enhanced services to New Yorkers.* Public policies should foster research and innovation in the telecommunications industry and in information-using industries.

7. *Strengthen democracy and individual rights.* New York policymakers need to ensure a free flow of information and ideas, recognizing that the ability to communicate freely is a cornerstone of an open, democratic society. Unregulated control of the content, access, service quality, or pricing of communications services essential for full participation in modern society cannot be tolerated. All New York citizens should have access to any information and entertainment that they choose at a reasonable cost. Policymakers must retain authority to ensure that these circumstances continue.

Key Recommendations

The Exchange determined that these goals could best be reached through the following policies.

1. *Develop an open network-of-networks telecommunications system.* An open telecommunications network of networks requires a set of rules to ensure that all interested parties are fully able to participate and compete in the network, without discrimination. The Public Service Commission should develop the policies and regulations necessary to achieve and oversee an effectively competitive, interconnected network of networks in New York, as described in the report, including flexibility to reduce or eliminate unnecessary regulation. These policies and regulations should remove barriers to entry, ensure fair and open interconnection, provide appropriate incentives, and maintain the obligation of common carriers to carry and deliver information traffic to its intended destination.

2. *Establish a universal service funding mechanism.* The long-standing system of subsidies internal

to the current public switched network is out of date. A competitive, multiprovider network demands an innovative response to the state's obligation to ensure universal access. The Public Service Commission should develop an explicit mechanism for financing universal service. This could take the form of a dedicated fund, financed by contributions from providers, or of tax credits for providers, or some other possibilities might also be considered.

3. *Create a level regulatory playing field.* The state's regulatory structure should keep pace with the emerging industry structure. Advanced technology, particularly digitization, is breaking down traditional separations between the transmission of sound, image, and computer data, and consequently among the telephone, television, and information industries.

The current regulatory structure in New York separates state-level regulation of telephone and cable television services between the Public Service Commission and the Commission on Cable Television, respectively. This dichotomy, although reasonable in an era when distinctions between these industries' service, technologies, and markets were clear, is becoming increasingly inefficient and ineffective as these industries converge. A common regulatory body with oversight over all providers of information transport would enhance New York's ability to foster an effective environment for competition and fair policies for interconnection, pricing, and infrastructure deployment. Just as the Federal Communications Commission and a number of other states currently regulate both cable and telephone services, a common state regulatory body could consolidate cable and telephone regulation while preserving those distinctions that remain sensible.

To begin the process of accomplishing this change as quickly as possible in an orderly fashion, the governor should propose new legislation which would transfer the regulatory functions of the Commission on Cable Television, together with the existing staff expertise, to the Public Service Commission, and make other necessary changes in the public service law to enable the Public Service Commission to carry out this new responsibility. A voluntary working group of the Telecommunications Exchange should be named to assist in the drafting process.

The Exchange recommends that all providers of common carrier services operate under the same rules and bear the same responsibilities. Cable and telephone carriers maintaining monopoly power should be restrained by regulatory oversight from exercising that power to inhibit the growth of new market entrants. To ensure the development and continuation of real and fair competition, New York should support cable telephone cross-entry [illegible] mergers for antitrust conflicts. Finally, the Public Service Commission's jurisdiction should be expanded to include existing state-level regulation of cable television, to the extent permitted by federal law.

4. *Avoid new taxes on telecommunications and consider tax reform.* The Exchange recommends that no new taxes be imposed on either the information transmission industry or on the information services industry. New York's taxes already are higher than those in neighboring jurisdictions. In addition, as fiscal conditions permit, the Exchange recommends that the gross-receipts tax be phased out and replaced with the standard corporate income tax.

3. *Establish benchmarks and incentives for the development of a modern infrastructure.* To ensure that the private sector continues to provide New York with the telecommunications capabilities needed to compete in world markets, the public sector should monitor and evaluate developments in New York's telecommunications system. Progress should be judged according to benchmarks that are regularly revised to reflect the needs of all New Yorkers, including residential consumers, small businesses, schools, healthcare providers, minority groups, persons with disabilities, and elderly citizens. Technological innovations and infrastructure development in other states and nations should also be ingredients in the process of setting New York's benchmarks.

6. *Promote diffusion.* The Exchange recommends that the state establish a vigorous program to identify and remove barriers to the diffusion of modern telecommunications technology. Modeled after the agricultural extension service that has so successfully spurred productivity and the growth of agriculture, the diffusion program should help smaller businesses, public agencies, educators, rural residents, libraries, minority groups, healthcare providers, persons with disabilities, community-based organizations, non-English speakers, and other groups make the best use of new and established telecommunications capabilities.

6a. *Establish a new state Office of Telecommunications, consisting of a small expert staff to be located in the Office of Economic Development, to organize and manage the state's diffusion program.* The Office's responsibilities would include: providing policy recommendations on the nonregulatory aspects of telecommunications; identifying barriers to the use of modern telecommunications services and technologies; acting as an information clearinghouse; coordinating public-sector initiatives and demonstration projects; helping minority and women-owned firms providing telecommunications services to gain greater access to capital, more participation in research and development activities, including demonstration projects, and helping them form partnerships with larger providers; working with organizations serving persons with disabilities to provide access to modern telecommunications services; and working with educators and healthcare providers to make greater use of telecommunications.

An Advisory Council representing consumers, telecommunications firms, businesses of different sizes, persons with disabilities, libraries, nonprofit organizations, minorities, community-based groups, non-English speakers, educators, healthcare providers, and public agencies would advise the Office on its priorities and cooperate with it on implementation activities.

[illegible] *Diffusion and Labor Market Transition Fund.* To be successful a diffusion program will have to do more than provide education and technical assistance. One of the best ways [illegible] and individuals gain practical experience in using new services and technologies. To help manage and finance projects, the Exchange recommends the establishment of a nonprofit entity, the Diffusion Fund, a flexible private-sector vehicle independent of the state Office of Telecommunications and the Department of Public Service. Federal, state, and private-sector monies could be used for the Fund, which would work in cooperation with the Office and other agencies to promote diffusion projects in all regions of New York, demonstrating how modern telecommunications can promote economic growth, [illegible] the social and educational objectives of all New Yorkers as articulated by this report.

7. *Make government work better.* Government can do a better job of using telecommunications both to communicate with the public and to operate more efficiently. The governor should establish an interagency council of telecommunications to encourage ways to make better use of telecommunications through coordinated public-sector purchases of telecommunications equipment and cooperative use.

8. *Support an active labor force strategy.* Too often, labor policy is passive, reacting only when workers are laid off. The Exchange believes that New York needs an active labor force strategy that promotes the quality and productivity of our human resources, enhances occupational flexibility and employment opportunity, and reduces time lost in employment transition. The Exchange recommends that the governor call for a Telecommunications Business-Labor Compact for New York, made up of employers, unions, government, and educators. The Compact should explore workforce and labor implications of emerging telecommunications markets and recommend specific steps that government, industry, and labor can take to address the dislocations caused by the advent of widespread competition.

9. *Form a working group for implementation of the Exchange's report.* Exchange members and other participants, in cooperation with the Public Service Commission and the Department of Economic Development, should form working groups to help guide and provide feedback on the implementation of the Exchange's recommendations.

The Exchange believes that the goals it has articulated are sound. These policies, if pursued, can enhance the vitality of New York's economy and improve the quality of life for all New Yorkers.

1. A Foundation of 21st-Century Society

Each week newspapers, magazines, and television feature stories about the information age, the rapid advance of technology in computers and communications, and dramatic corporate and government changes and start-ups in every phase of the worldwide telecommunications industry. In the last year, U.S. West announced a multibillion-dollar investment in Time-Warner; AT&T initiated its purchase of McCaw Cellular; NYNEX, with its investment in Viacom, entered the bidding for Paramount; and Bell Atlantic began its $30 billion acquisition of Tele-Communications Inc. and Liberty Media. These transactions demonstrate a remarkable technological and corporate convergence: audio, data, and video messages can be transmitted with the same equipment, by the same diversified companies. The size of these deals reflects the tremendous stakes in future revenues and profits expected from advanced communications technologies. These deals herald a dramatic restructuring of our marketplaces, redrawing the lines of traditional products and organizational structures.

Reports of astounding technological advances tempt us to speculate what our lives might be like in the next century. It is easy to imagine the manager of a Manhattan garment manufacturer videoconferencing in 2005 with clients and suppliers, or to envision her younger brother at a high school in the Bronx using a video communicator to attend class with students in Westchester. Perhaps we see her aunt in Oriskany Falls having a video checkup with a heart specialist in Manhattan, or her father, who has a disability, telecommuting with his office in Syracuse.

Audio, data, and video messages can be transmitted with the same equipment, by the same diversified companies.

Two related technological innovations make possible this new world. One is digitization—the process by which computers and telephones translate data, image, video, and audio information into easily manipulated streams of 1s and 0s. When this process was first developed, it opened a vast new field for telecommunications applications. With digitization, the phone networks were employed to connect computers, transmitting digital data. But telephone equipment was not ideally suited for communication between computers. One expert pointed to bandwidth, or transmission capacity, as the issue: "Telephones provided a small bandwidth connection for a relatively long period of time. Computers, by contrast, need huge bandwidths for microsecond bursts."[1]

Breakthroughs in information processing made it possible for companies to pursue new competitive strategies. Combining computers with their telecommunications systems, companies began to coordinate production, distribution, and sales in dozens of sites scattered around the nation and the globe. Recognizing the importance of telecommunications to their competitive strategies, a number of large users sought to bypass the slower public network and create their own private, high-speed networks.

The second technological breakthrough is the increase in bandwidth, or transmission capacity. Fiber-optic cables, slender strands of transparent

glass, can transmit 27 billion bits of information—enough to fill 800,000 pages of text—in one second. A digital broadband system, relying on fiber, coaxial cable, possibly wireless, or on some combination of transmission modes, will make possible the transmission of "multimedia" applications, combining audio, video, and data communications within a computerized setting. Multimedia applications are expected to be useful in education, healthcare, and other areas.

These technological and institutional changes are expected by some analysts to speed the growth of interactive, computer-linked networks that will offer new services and hasten profound changes in economic and social life.

Modern telecommunications will be a foundation of 21st-century societies.

Modern telecommunications will be a foundation of 21st-century societies. Telecommunications can change our future as much as railroads, telephones, electricity, and automobiles have shaped our lives and those of our ancestors. Modern, efficient telecommunications can improve the quality of our lives and spur the growth of the economy. By developing policies that optimally influence the use and deployment of telecommunications, New York can maximize the benefits and minimize the costs of this crucial infrastructure.

Underpinning New York's Economic Strength

The telecommunications industry is playing two increasingly important roles in New York State's economy. First, many New York industries are major users of telecommunications services. As Table 1.1 shows, more than half of the state's workers are employed in industries where unit telecommunications expenditures are higher than average.

TABLE 1.1 Employment in Seven Large Telecommunications-Intensive Sectors in New York State, 1992

Industry	Employment (thousands)	Percent of Total N.Y. Employment
Finance and insurance	598.9	7.8
Personal services	70.6	0.9
Wholesale and retail trade	565.9	20.3
Business services	397.0	5.1
Transportation and utilities	400.2	5.2
Electronic and equipment	6.6	1.1
Miscellaneous services	1868.8	24.2
Total	4988.0	64.6

Source: Bureau of Labor Statistics

The U.S. Department of Labor projects that information-intensive industries like services, retail trade, finance, insurance, and real estate will enjoy the greatest job growth for the next 12 years.[2]

Telecommunications is what economists call a key sector.[3] The pattern of interindustry relations gives rise to *forward-linkage* and *backward-linkage* effects. A rapid pace of telecommunications innovations means that equipment manufacturers, linked backward to the telecommunications industry, will invest and grow, while the industries with forward connections—like New York's business services—can continuously improve their operations. According to one expert, these forward linkages are particularly important with telecommunications.[4]

Many of New York City's most important industries, such as publishing, television, and financial services, also depend heavily on telecommunications. According to one report, New York State is "home to the world's largest concentration of telecommunications-intensive economic activities."[5] A 1987 study estimated that 60 percent of business activity in the greater New York City area is derived from information services.[6] According to the New York City Partnership, a group of business leaders, these industries depend significantly upon state-of-the-art telecommunications to improve productivity and remain competitive.[7]

Information is becoming a key economic resource.

Businesses need to locate where they can communicate quickly and cheaply with their customers and suppliers. Although the telecommunications infrastructure is not the only factor affecting location (real estate costs and quality of life issues also matter), it is certainly an important one. States can be placed at a competitive disadvantage if they fail to maintain modern, affordable telecommunications networks. For New York, this is an important concern because the state's economy is particularly dependent on telecommunications.

A recent Price Waterhouse survey of more than 300 executives (in 35 industries where New York City has a competitive edge) found that most of them cited access to state-of-the-art telecommunications as an important consideration when choosing a location for their headquarters.[8] Although [illegible] tions capabilities are also important to the firms located elsewhere in New York State. If New York's economy is to flourish, modern, efficient telecommunications must be available throughout the state.

Information is becoming a key economic resource. Some large businesses are looking for options that allow greater control over their information resources. These large telecommunications users have expressed interest in:

- *Statewide virtual networks*: Would allow employees to call company locations throughout the state by dialing a four- or five-digit number.

- *Bandwidth on demand:* Would allow companies to quickly move from narrowband to broadband transmission and back, depending on their immediate telecommunications needs.

- *Improved billing systems:* Customers want bills reflecting their individual specifications.

- *Intelligent network services:* These include caller identification, an 800 database, personal numbers, call routing, and database access.

- *Network reliability:* Lack of reliable telecommunications services hurts business competitiveness. According to the New York City Partnership, Inc., a one-day disruption in telecommunications services in New York's financial markets could result in a loss of $1 trillion.[9] Responding to this report, the Mayor's Task Force on Network Reliability established a mutual aid agreement to help providers restore service more quickly.

The telecommunications industry produces high-paying jobs.

In the highly competitive international economy, companies must choose a global strategy if they are to survive. Modern, efficient communication technologies and networks are essential to the competitiveness of corporations. Telecommunications plays a critical role in linking New York firms with worldwide systems of production and distribution. According to one study, more than one-third of all U.S. international telephone calls originate from New York.[10] Networking on a global scale is now a virtual necessity for leading companies. An executive of a major airline states:

> Without [telecommunications], we would not . . . be able to compete globally. . . . The timely availability of high-quality, cost-effective voice and data service over all the different communications mediums is absolutely critical to us.[11]

In addition to influencing telecommunications-buying industries, New York's telecommunications industry affects the state economy by creating its own jobs, income, and investment. The telephone communications and cable television industries alone employed 86,000 people in New York in 1991. Although employment in the telephone communications industry declined from 1982 to 1991, employment in the cable television industry rose from 1988 to 1991. The telecommunications industry produces relatively high-paying jobs in both the state and the nation. In New York, average employee earnings in the telephone industry were $42,944 in 1991, while the average cable employee made $37,089. For all industries, average annual employee earnings amounted to $29,780.[12] Nationwide, operating revenues in the telephone industry increased from $134.7 billion in 1988 to $151.5 billion in 1991. Revenues from basic cable subscription also rose,

from $7.3 billion in 1988 to $10.2 billion in 1990 and are expected to grow to almost $14 billion in 1993. New York is also home to a radio and television broadcasting industry that employs 25,000 people who earn an average of $40,000 per year.

While many large businesses have proven adept at using telecommunications, some small and medium-size New York businesses, schools, healthcare providers, nonprofit organizations, community-based organizations, and public agencies have not. In these sectors, available telecommunications are often not widely or wisely used, suggesting the existence of barriers to diffusion. Economists who have studied the general problem of diffusion of innovations have identified a number of barriers. First, the cost of new equipment and training is sometimes prohibitive. Second, in some cases, diffusion is slowed by the persistence of old habits and ways of thinking. According to one economic historian, railroads were originally thought of as feeders to canals and other forms of water transportation. In the early days of radio, that medium was thought of as a supplement to the telegraph—to be used for isolated locations and ships at sea.[13] A third factor is the lack of knowledge and skills among potential users. The effective use of a new technology often requires the development of a user's skills, and in many cases, those skills can be learned only by using the technology.

Available telecommunications are often not widely or wisely used, suggesting the existence of barriers to diffusion.

Small businesses, unlike large businesses, do not generally have the benefit of flexible in-house resources necessary to quickly become effective users. As technology continues to change, this problem is becoming more acute. As larger businesses adopt new methods, more small companies will need to become networked with large retailers, wholesalers, and manufacturers—companies that increasingly require suppliers to transmit electronically their purchase orders, invoices, and shipping information.

Innovative telecommunications [illegible] small manufacturing firms are dramatically revitalizing certain regional economies in Japan and Europe.[14] Small export-oriented firms in Italy's Emilia-Romagna region have formed flexible manufacturing networks (not private telephone networks) to help them [illegible] These networks help small manufacturing firms develop supportive relationships with larger companies, suppliers, and government organizations, which can offer technical and financial assistance. Telecommunications services link these parties to help them access and exchange information easily and rapidly. Such networks, though prominent in Europe, may not be developing with the same intensity in New York or other regions of the United States, although New York State's ExceLink project is one welcome exception.[16] Lacking the economies of scale enjoyed by their large competitors, small American firms often find it difficult to afford to learn more about advanced telecommunications services and hardware.

A Vital Infrastructure in Nations and States

New York is not alone in recognizing that telecommunications is increasingly important for economic development. Countries such as the United Kingdom, Japan, Germany, France, and Singapore realize that a modern, efficient telecommunications systems can help increase the productivity and competitiveness of their citizens and businesses as well as attract foreign companies. These nations are moving to expand the capabilities of their networks, through wider deployment of broadband and digital capabilities and, at least in the United Kingdom and Japan, more competition. Since many of these countries have national telephone monopolies (although some are now privatized), they cannot be models for the United States and New York. But U.S. policymakers need to take into account the future capabilities of our competitors and ensure that we stay ahead.

Competition for business, jobs, and investment is also intense within the United States. A number of states, including Tennessee, New Jersey, and Pennsylvania, have adopted plans for the deployment of modern telecommunications capabilities as part of their economic development programs.

Widespread Social Benefits

Telecommunications may revolutionize our lives.

New telecommunications technologies are making possible products and services that may revolutionize our lives. For example:

- Students across New York, including those in rural areas and people with disabilities, may have greater access to courses and libraries around the world, enhancing their knowledge and skills. These technologies virtually eliminate the structural and transportation barriers to education.

- Healthcare information will be available more quickly, when and where needed, to help [illegible] primary care providers in rural areas of the state to consult with specialists at metropolitan hospitals.

- New Yorkers with disabilities will be able to access a variety of information and services via electronic media to overcome barriers to full participation in the economic and social mainstream.

- New Yorkers will be better able to telecommute to their offices, saving time and money now spent in transit.

- Citizens may be able to obtain better services from state and local governments more easily.

Electronic "meetings" by means of a computer bulletin board system can link individuals together. People who live in rural areas or who have transportation barriers can benefit greatly from this form of technology. Bulletin board systems can serve as platforms on which information and ideas can be shared and disseminated, and peers can network.

Because of the plethora of opportunities that telecommunications technology holds for individuals with disabilities, steps must be taken to ensure that the technologies are accessible both physically and financially to all persons who could benefit from them. Today equipment exists that can improve the independence and quality of life for individuals with disabilities. However, learning about the equipment, affording it, and operating it are often problematic.

At present these capabilities are not widely used. To the extent that advanced telecommunications render these applications more useful and widely available, they will improve the quality of New Yorkers' lives and the vitality of the New York economy.

SUPPORTING FUNDAMENTAL EDUCATIONAL IMPROVEMENT

Telecommunications is beginning to reshape the process of education. Ever-expanding computer networks allow students to participate in distance learning and make use of virtual classrooms, and allow students and researchers from around the world to collaborate on projects. Students, researchers, and teachers have increasing access to digital libraries of books, journals, images, music, and videos, as well as real-time access to, and use of, supercomputers and supercomputer grids.

At present, telelearning programs serving grade schools and community colleges in New York are local initiatives. Examples of these include: Infinet 2000, which serves six school districts in Dutchess County, linking teachers' computers, electronic blackboards, fax machines, and videocassette recorders; an audio, video, and data link between Hudson Valley Community College and the State University of New York (SUNY) at Albany, featuring electronically sensitive chalkboards and cameras that automatically track instructor location; and links of the City University of New York (CUNY) distance-learning links to various locations in New York City as part of the New York Community Learning and Information Network (NY CLIN).

New York's educational system can benefit from expanded uses of telecommunications.

Despite the promise of these initiatives, New York's educational system has yet to make the best possible use of telecommunications. Schools, colleges, universities, and libraries currently lack an integrated, fully accessible, cost-effective, standardized, statewide telecommunications infrastructure. Existing educational networks, which are discussed in Chapter 2, are often costly, sometimes redundant, and usually not connected to other telecommunications networks supporting state and local government agencies, business, industry, and the public—a deficiency that diminishes their potential benefits. Moreover, not all citizens and communities

in the state are served by the existing educational networks; access to educational telecommunications capabilities and resources often depends on geographic location and income. If these circumstances continue, many children and adults will be isolated from the enormous instructional and research opportunities afforded by an appropriately designed, ubiquitous, integrated network.

Many states are investing in interactive networks to expand the educational capabilities available to their citizens. For instance, Arkansas plans to develop a telecommunications network linking many of its universities, schools, and continuing-education centers to provide distance- learning programs throughout the state. Other states such as Maine, North Carolina, Georgia, and Iowa have plans to build interactive networks for distance learning, as well as academic and scientific research and information exchange programs.

PROVIDING BETTER HEALTHCARE AT LOWER COST[17]

As the nation debates healthcare reform, the twin needs of expanding access and controlling costs are becoming more acute. Modern telecommunications can help New York meet both of these needs and will be an important part of the systems that emerge from today's debates.

Telecommunications can allow healthcare providers to cut costs.

Healthcare is now, and will continue to be, provided through the collaborative efforts of a community of practitioners and providers, who provide a continuum of care to meet the changing needs of New Yorkers. Services from primary and preventive care to chronic, rehabilitative, and skilled nursing care, and to hospice services are provided by a wide range of practitioners and providers. Settings and locations for these services include physician offices, clinics, hospitals (emergency, acute, and other services), long-term care facilities, specialty and rehabilitation services and institutions, home health services, and community-based services for the mentally ill, those with substance abuse problems, and others. Telecommunications offers an exciting opportunity to better link these caregivers to each other and to the patients, and to foster education and dissemination of information to improve health. In fact, the opportunities for such telecommunications uses will grow as healthcare networks are designed and developed as part of the national and state reform efforts.

Telecommunications can allow healthcare providers to cut the costs of medical record keeping. Faster retrieval of information from other institutions will increasingly enable providers to make better use of patients' records. For example, a computerized system will provide doctors and hospital staff with vital patient information such as drug allergies, current medications, and previous surgeries. New applications will also reduce the costs associated with record storage by automating record keeping, easing the aggregation of medical information for research purposes, and improving the review of medical records with artificial intelligence. It has been