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THE NEW URBAN TELECOMMUNICATIONS INFRASTRUCTURE

by MITCHELL L. MOSS*

TABLE OF CONTENTS

I. TELECOMMUNICATIONS AND CITIES	323
II. INVESTING IN TELECOMMUNICATIONS	324
III. THE NEW TELECOMMUNICATIONS INFRASTRUCTURE	326
IV. SMART BUILDINGS	327
V. TELEPORTS: THE TECHNOLOGICAL FIX	328
VI. THE CHALLENGE FOR RESEARCH	329
CONCLUSION: THE ROLE OF PUBLIC AND PRIVATE POLICYMAKERS	330

Advanced communication technologies are transforming the form and function of our nation's large metropolitan regions. For centuries, the growth of cities depended on transportation linkages to facilitate the movement of people and goods. As advanced, industrialized nations rely more heavily upon information-based services, the viability of a metropolitan region will depend on its communications infrastructure to facilitate the movement of ideas and information. This article will examine the components and implications of the changing urban telecommunications infrastructure and its impact on research and policymaking.

I. TELECOMMUNICATIONS AND CITIES

It has been noted that every society is linked by three different types of infrastructures: transportation, energy, and communications. "The revolution in communications now makes it likely that there will be a major shift in the relative importance of the infrastructure: com-

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munications will be the central infrastructure tying together a society."¹ Unlike the transportation infrastructure—the network of roads, bridges, freeways, and airports that has been planned and managed mainly by the public sector—the communications infrastructure has mainly been designed and built by the private sector.

The telecommunications infrastructure—the wires, ducts, and channels that transmit voice, data, and video signals—is a remarkable mystery in most cities. This is partially a result of the dominant roles played by AT&T, which developed most of the nation's telecommunications network, and the Federal Communications Commission, which predominates in regulating the communications industry. Furthermore, the high quality of our nation's telecommunications system has allowed citizens and public officials to take the system for granted. For instance, state governments have played largely a reactive role in reviewing rate structures, and local governments, although major users of local telephone networks, have chosen to focus their attention on cable television franchises. It has been noted that policymakers have neglected the urban communications infrastructure in spite of the deep involvement of local governments in specific communication systems:

General purpose urban governments or their delegates have sometimes accepted explicit authority over a broadcasting frequency. Public broadcasting stations assigned to non-profit "community" groups may sensibly be seen as specialized communication policies. Virtually all city governments operate substantial telecommunication facilities for the use of police and fire departments.²

II. INVESTING IN TELECOMMUNICATIONS

The divestiture of AT&T, in conjunction with advances in transmission systems, microprocessors, and electronic memory, is currently creating a new telecommunications environment at the local and regional levels. Two forces underlie the change in the pattern of telecommunications development in urban regions. First, large organizations have begun to accept communication systems as strategic assets rather than just high cost sources. Telecommunication systems offer a way to reach new markets and to create new products and services. Citicorp's successes in national and international banking are a reflection of its pioneering role in deploying advanced information technologies. As Walter Wriston, the former Citicorp chairman, has said, "the most valuable piece of real estate in the world is your desk." Once a bank's ter-

1. Bell, *Communications Technology—For Better or Worse*, HARV. BUS. REV., May-June 1979, at 20, 22.

2. S. Mandelbaum, *Cities and Communications: The Limits of Community* 3 (1985) (unpublished manuscript).

minal is on it, and if the customer is happy with the service, then it becomes very difficult for a competitor to dislodge.³

The second major force shaping the new telecommunications infrastructure is the increased investment in information workers. Until recently, private organizations invested less than half as much for capital equipment per information worker as they invested for production workers. In 1977, in which the amount for machinery in which businesses were investing to support their white collar workers was only half the amount they invested to support their blue collar workers. By 1982, the amount of investment in these two areas had become equal.⁴ Most of the capital investment in new communications technology has been traditionally oriented toward clerical and administrative staffs. In the future, investment will be channelled towards middle and senior management, where personnel costs are substantially higher than those of lower-level employees.

Financial services firms provide a clear example of increased investment in computers and other telecommunication systems. Banks, insurance companies, and securities firms have shifted from being labor intensive to being capital intensive industries. The offices of these firms require large floor areas that can accommodate computers and support personnel and high energy loads. These offices also require raised floors to accommodate communication ducts and wires. These financial institutions now have invested more in telecommunications than in labor. The investment in technological capabilities has led to the advent of around-the-clock operations and to the need of buildings to be located in areas which can accommodate such operations. Consumer banking has become decentralized with the advent of telecommunication systems that allow people to use automatic teller machines at shopping centers or local supermarkets, and eventually at home through personal computers.

As a result of these forces, the traditional division between vendors and users of communication services are becoming blurred and, in some cases, no longer exist. Many organizations, recognizing the indispensability of an adequate communications network, are developing their own telecommunication networks to accommodate their future growth and market orientation. With the advent of deregulation, computer firms are now in the telephone business, while telephone companies are just as involved in the marketing of computer equipment and software.

3. Hakim, *A New Awakening*, *ECONOMIST*, Mar. 24, 1984, at 5, 73 (International Banking Survey).

4. C. Jonscher, *The Impact of Information Technology on the Economy: Problems of Modelling and Measurement 3* (Feb. 1985) (prepared for Conference on the Impact of Information Technology on the Service Sector, University of Pennsylvania).

As companies face a growing need to link their information-intensive offices with advanced telecommunication systems, this cross-over among industries will continue.

III. THE NEW TELECOMMUNICATIONS INFRASTRUCTURE

The intense use of communication and computer systems in offices has led to changes in our telecommunications infrastructure at the national, regional, and local levels. There is a rush to build optical fiber networks that can provide high-speed, long distance communications networks across the country. The rush to build optical fiber systems resembles the rush to build railroads in the nineteenth century; whoever builds the first integrated network can expect to capture much of the long distance communications business.⁵

At the regional level, diverse telecommunication systems are being installed and expanded. New York Telephone, for example, has built a high-capacity optical fiber "ring" around Manhattan that links its twelve major switching centers, while in Southern California, the optical fiber network built for the 1984 Summer Olympics is an advanced regional communications network. More than one-third of all the Bell System's optical fibers have been installed in New York Telephone's service area—a reflection of the great demand for high-capacity communication systems within major cities and surrounding metropolitan regions.⁶

Although the regional holding companies created from the AT&T divestiture remain the predominant communication carriers at the local level, organizations with sophisticated and specialized communications needs, such as universities, hospitals, and banks, are finding that competition has generated new choices in telecommunication technologies, costs, and services. Microwave, optical fiber, cable television, digital termination systems, and subscriber radio are among the technologies that serve the diversified local communications market. In addition, firms with a large volume of long distance calls often "bypass" the "facilities of the local telephone companies available to the general public" in order to avoid paying the rates charged for use of the local public network.⁷

Overwhelmingly, the telephone is used for inter- and intra-urban communications—not for linking people in remote regions. Approximately thirty-three percent of interstate business message toll service

5. See Johnston, *The Coming Glut of Phone Lines*, FORTUNE, Jan. 7, 1985, at 96, 98.

6. E. LIU & K. VASELKIV, NYNEX CORPORATION, GOLDMAN SACHS, INVESTMENT RESEARCH 13 (Dec. 19, 1984).

7. FEDERAL COMMUNICATIONS COMMISSION, COMMON CARRIER BUREAU, BYPASS OF THE PUBLIC SWITCHED NETWORK 4 (Dec. 19, 1984).

and WATS revenues are generated by calls among the sixteen largest metropolitan areas and fifty percent among the thirty-two largest cities.⁸ According to a report issued by the House Subcommittee on Telecommunications, Consumer Protection, and Finance, "most business communications travel only a relatively short distance. Only about 8 percent of communications traffic travels more than 500 miles. Thirty-two percent travels between facilities less than 500 miles apart. The remaining 60 percent is intrafacility."⁹ This is quite evident within cities. In New York City, seventy-five percent of all telephone calls originating in Manhattan are to other locations in Manhattan. Intra-borough telephone calls account for at least sixty percent of the telephone calls within each of the city's five boroughs.¹⁰ Even though communications technology allows social and business relationships to be geographically extended, the connections remain primarily within large urban regions.

Overseas telephone traffic is particularly centered in the nation's leading cities. In 1982, New York City and Los Angeles accounted for approximately one-third of all overseas telephone message units from the United States, excluding Canada and Mexico.¹¹ Communication technologies have strengthened large multinational firms that are headquartered in large urban centers by allowing the firms to control and coordinate production and distribution activities on a global scale.

IV. SMART BUILDINGS

Among the popular press, there is much talk about "smart" or "intelligent" buildings as real estate developers add telecommunication systems to the services already available to tenants. The term "smart building" has been used in three different contexts. First, it can refer to an integrated management system for elevators, energy, security, and other building services. Second, it can refer to an integrated telecommunications network for local, long distance, and enhanced services. Finally, it can refer to buildings with integrated telecommunication and building systems.¹² A new industry is evolving to provide "shared tenant services"—sophisticated telecommunication systems within build-

8. Langdale, *Competition in Telecommunications*, 6 TELECOMMUNICATIONS POL'Y 283, 289 (1982).

9. MAJORITY STAFF OF THE HOUSE SUBCOMM. ON TELECOMMUNICATIONS, CONSUMER PROTECTION AND FINANCE OF THE HOUSE COMM. ON ENERGY AND COMMERCE, 97th CONG. 1st SESS., TELECOMMUNICATIONS IN TRANSITION: THE STATUS OF COMPETITION IN THE TELECOMMUNICATIONS INDUSTRY 227 (1981).

10. New York State Public Service Commission, Case No. 28482 (1983) (testimony of New York Telephone).

11. Moss, *New York Is Not Just New York Anymore*, INTERMEDIA, July-Sept. 1984, at 10, 10-11.

12. See Gannes, *The Bucks in Brainy Buildings*, FORTUNE, Dec. 24, 1984, at 132.

ings that offer economies of scale and "one-stop" convenience to small and middle-sized organizations. Olympia and York, the largest real estate developer in North America, has formed a joint venture with United Telecommunications, Inc., to create OlympiaNet, a telecommunications network that will offer advanced data, voice, and video services to all of its tenants. Many other organizations have formed partnerships to offer similar building-based telecommunications services.

For real estate developers, telecommunications can provide a new source of revenue as well as providing an attractive service to tenants. Given that most office buildings have long lives and that most of the nation's building stock is currently in place, the challenge lies in retrofitting existing buildings in order to accommodate new telecommunication systems. Office buildings can no longer be considered in terms of their capacity to accommodate people; a building is also a resource for the transmission of voice and data messages (as reflected in the growing use of satellite and microwave dishes on the rooftops of office buildings). Access to the roof is now a critical part of almost all leases; the rooftop has replaced the groundfloor in terms of real estate value. A question still remains, however, as to whether it is wise to incorporate all building and telecommunication services into a single system.

V. TELEPORTS: THE TECHNOLOGICAL FIX

The popularity of teleports across the nation represents the diffusion of an idea prior to its full implementation. The original concept of a "teleport" started with the Port Authority of New York and New Jersey. The concept was based on a far-sighted view that the public sector should provide a facility, similar to airports, which provides access to communication satellites. The large volume of electronic communications in New York City led the Port Authority to believe that access to communication satellites would be crucial to maintain the health of the region's economy. Microwave congestion within New York City contributed to the need for a teleport with an alternative local distribution system. This need led to the proposed optical fiber system linking the Teleport on Staten Island to New Jersey and other parts of New York City. Subsequently, an office park was incorporated in the project, since the site offered excellent access to a skilled labor force, low-cost energy sources, and land for back-office facilities.

Responsibility for the Teleport was divided among the City of New York, which leased the land to the Port Authority, and to the Port Authority, which developed the land and leased the buildings on the site. Merrill Lynch and Western Union were brought in as partners in Teleport, Inc., to manage the communication systems. The City of New

York and the Port Authority of New York and New Jersey were to receive a percentage of the net profits from Teleport, Inc. The most impressive aspect of the Teleport, however, has been the speed with which other cities have initiated efforts to build their own teleports. In many communities, existing satellite antenna farms with microwave links have been renamed as "teleports" and are operated entirely by the private sector.

The popularity of teleports is not based on any evidence that they can stimulate economic development. Rather, the popularity of teleports demonstrates that public investments are often made on the basis of "municipal chic," not unlike the popularity of building sports stadiums, convention centers, and cultural centers a decade ago. Advances in optical fiber technology and in Ku-band satellite technology, enabling small satellite dishes to be built directly next to or on top of buildings, however, may ultimately limit the appeal of teleports as currently conceived. Ironically, technological solutions may be preempted by new technologies.

VI. THE CHALLENGE FOR RESEARCH

Contrary to popular belief, communication technologies have not replaced face-to-face contact. Rather, new communication systems have enhanced those cities that serve as the information centers of the world. Rather than lead to the obsolescence of cities, new communication technologies have contributed to the emergence of a handful of "world cities" that are "[t]ightly interconnected with each other through decision-making and finance."¹³ The widespread deployment of advanced telecommunication systems has strengthened those cities that are communication hubs while they have weakened older communities rooted in the manufacturing of goods. Because a new and sophisticated telecommunications infrastructure is being built within large metropolitan regions to accommodate sophisticated data and voice services, those communities that are already equipped to handle such technologies are at an advantage.

More than a decade ago, Melvin Webber described cities as "communications switchboards—the locales where the greatest numbers of connections are joined and where the transactional business of the society is most easily accomplished."¹⁴ Webber identified two major communication patterns: internal or local to other locals, and external, local establishments to the nation and world. There has been surpris-

13. Friedmann & Wolff, *World City Formation: an agenda for research and action*, 6 INT'L J. URB. & REGIONAL RESEARCH 309, 310 (1982).

14. Webber, *Urbanization and Communications*, in COMMUNICATIONS TECHNOLOGY AND SOCIAL POLICY 299 (G. Gerbner, L. Gross & W. Melody ed. 1973).

ingly little empirical research on the magnitude and type of communications functions that cities serve.¹⁵ We need to improve our knowledge and understanding of the relationship between new telecommunication technologies and the rich web of interpersonal communications that occurs in cities. The evidence to date indicates that communication technologies are vital elements in maintaining and stimulating both internal and external patterns of urban communications.

CONCLUSION: THE ROLE OF PUBLIC AND PRIVATE POLICYMAKERS

While the private sector was investing in new optical fiber, microwave, and satellite systems, cities were focusing their attention on cable television systems. After two decades of speculation about becoming the "wired nation," cable television has yet to arrive in most large American cities.¹⁶ The private sector has been responsible for the development of telecommunication systems that have reshaped the organization of work in metropolitan regions—making these systems far more important than cable in this respect.

There are several valuable lessons to be gained from this experience. First, it is essential to recognize the distinctive roles of government and business. Public intervention in a technologically-driven industry requires a "fine," not a "heavy" hand. The private sector should be the engine of telecommunications development at the urban level, since advances in technology are rapid, and the private sector is better equipped to handle such development. As the case of cable television franchises shows, government can become fixated on one type of technology or communications facility. The public sector, however, should monitor private sector initiatives and use private telecommunication networks for serving public purposes.

Second, it is essential to recognize that telecommunications is a "permissive" rather than a deterministic factor in office location; it can contribute to the attractiveness of a site or a structure, provided that other critical infrastructure components are also available.¹⁷ Telecommunications has not led to the growth of office complexes in the nation's hinterland. Rather, it has reinforced the central city and suburban locations that were already serving information users.

Finally, our approach to understanding urban growth must be re-

15. See, e.g., R. MEIER, *A COMMUNICATIONS THEORY OF URBAN GROWTH* (1961); J. Gottman, *The Coming of the Transactional City*, (1983).

16. See Moss & Warren, *Public Policy and Community-Oriented Uses of Cable Television*, 20 *URB. AFF. Q.* 233, 238 (1984).

17. See Goddard, *Technology Forecasting in a Spatial Context*, *FUTURES*, Apr. 1980, at 90, 97.

vised. The vitality of a city will increasingly be a product of the messages that flow in, out, and through an urban region, rather than of the numbers of people who live and work in a community. As Manuel Castells has said, "places become transformed into flows."¹⁸ Just as the number of ships that arrived at a port was once regarded as the measure of a city's economic activity, the information that flows in and out of a city will be the appropriate indicators of a community's well-being in the twenty-first century. For scholars of communications, the emerging telecommunications infrastructure presents both a challenge and an opportunity. The challenge is to develop theoretical concepts and empirical techniques for analyzing the relationship between new telecommunication systems and existing communication processes. The opportunity is to improve our understanding of how communications technology influences the organization of work, time, and space in an advanced urban society.

18. M. Castells, *Towards the Information City? High Technology? Economic Change and Spatial Structure: Some Exploratory Hypotheses* 53 (1984) (University of California, Berkeley, Institute of Urban and Regional Development working paper).

