Cities in the Telecommunications Age

THE FRACTURING OF GEOGRAPHIES

James O. Wheeler, Yuko Aoyama,
and Barney Warf, Editors

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ROUTLEDGE
New York and London

Published in 2000
by
Routledge
29 West 35th Street
New York, NY 10001

Published in Great Britain by
Routledge
11 New Fetter Lane
London EC4P 4EE

Printed in the United States of America on acid-free paper.
Design: Jack Donner

Library of Congress Cataloging-in-Publication Data

Cities in the telecommunications age : the fracturing of geographies /
James O. Wheeler, Yuko Aoyama, and Barney Warf, editors
p. cm.
Includes bibliographical references and index.
ISBN 0–415–92441–3 (hb.). — ISBN 0–415–92442–1 (pb.)
1. Cities and towns—Effect of technological innovations on—United States.
2. Telecommunications—Social aspects—United States.
I. Wheeler, James O. II. Aoyama, Yuko. III. Warf, Barney, 1956– .
HT167.C483 2000
384'.0973—dc21 99–35013
CIP

ACKNOWLEDGMENTS

We wish to acknowledge funding from Dr. Wyatt Anderson, Dean of the Franklin College of Arts and Sciences at the University of Georgia, in support of the "Telecommunications and the City" conference held in Athens, Georgia, in March 1998, in which these book chapters were first presented in oral form. Thanks especially to Dr. George A. Brook, who served as Head of the Department of Geography at the University of Georgia during the period of this conference and who provided additional departmental financial support for the conference, leadership in initiating an ongoing series of state-of-the-art conferences in various topics in human geography, and dedicated personal support for our efforts. Thanks also to Ms. Audrey Hawkins, Department of Geography at the University of Georgia, who helped prepare material for the conference and who contributed invaluably to coordinating the conference and, in particular, in assisting in the preparation of the book manuscript chapters. We also gratefully acknowledge the assistance of Ms. Jodie Guy, Assistant Editor of *Urban Geography* at the University of Georgia; Ms. Loretta Scott, Ms. Kim Smith, and Ms. Emily Duggar, members of the office staff in the Department of Geography at the University of Georgia; and several graduate students (Mr. Christopher Bertaut, Mr. Jonathan Smith, and Ms. Selima Sultana). Thanks also go profoundly to each of the chapter authors for adhering to our deadlines for initial manuscript submissions and subsequent revisions. Our book enterprise has been possible only through the considerable support and aid of a committed group of professionals. We would also like to thank Emily E. Wheeler for her assistance during the conference.

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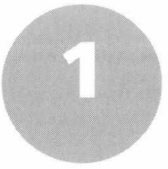
Introduction



INTRODUCTION

CITY SPACE, INDUSTRIAL SPACE, AND CYBERSPACE

James O. Wheeler, Yuko Aoyama, and Barney Warf

Cities in the Telecommunications Age: The Fracturing of Geographies grew out of a conference on "Telecommunications and the City" sponsored by the Department of Geography at the University of Georgia and held in Athens, Georgia, in March 1998. These chapters were drawn from more than forty-five papers presented at the conference, and were extensively revised for publication in this volume. The conference brought together many of the world's leading scholars conducting research on the telecommunications revolution.

The word *telecommunications* has a new meaning today. My 1978 *Webster's Dictionary* defines telecommunications as "communication by radio, telephone, telegraph, television," where the Greek stem word "*tele*" means "over a distance." "Telecommunications" is today used almost exclusively to refer to electronic transmission of information via computer networks. The Internet, a complex of networks linking computers worldwide, became accessible to people only very recently. The way to access documents over the Internet, stored in many different computers, was conceived only in 1989 by researchers in Geneva, Switzerland, and the halting use of what became known as the World Wide Web (WWW) did not begin until 1993, when a number of academics and online enthusiasts began traversing the Web (Shipley and Fish, 1996). In 1996, fewer than 40 million people were connected to the Internet; by 1997, the figure had risen to more than 100 million. In 1998, the volume of traffic on the Internet doubled every three months (Segaller, 1998).

It is within this exploding telecommunications revolution that this collection of chapters is set. A surprisingly large background of scholarly work has been accomplished in the area of telecommunications in the past few years, especially given the recency of developments. Castells's *The Informational City* (1989) set a broad view of how "information" was restructuring capitalism, capital-labor relationships, new industrial space, and the "space of flows." Hepworth's *Geography of the Information Economy* (1990) was among the first books to comprehend the role of computer networks on multilocational firms,

flexible production, and "wired cities." The Brunn and Leinbach collection of essays (1991) revealed the complexity and potential of the geographical consequences of communications and information. Kellerman (1993) focused on how telecommunications were impacting the global system of cities and the spatial arrangements of activities within cities. In a comprehensive survey of the literature, Graham and Marvin (1996) examined the extant research on telecommunications and the city, and provided a solid foundation for understanding the rapidly changing impacts of information technologies. It is Castells's trilogy (1996, 1997, 1998) that best places the context for *Cities in the Telecommunications Age: The Fracturing of Geographies*. Castells's thoughtful tour de force will long be read and valued as the most encompassing rendering and understanding of society and the economy in this early stage of the telecommunications age.

TELECOMMUNICATIONS AND URBAN SPACE

For nearly the first two hundred years of urban settlement history in North America, cities that prospered economically by creating employment opportunities and hence population growth were cities located strategically with respect to transportation routes. Large cities of the early to middle 1800s were positioned in coastal areas and had port functions that were almost exclusively tied to Europe. These important port cities included Boston, New York, Philadelphia, and Baltimore on the East Coast, and the lesser ports of Charleston, Savannah, and New Orleans in the South. Thereafter river cities (St. Louis, Cincinnati, Louisville, Pittsburgh) and later cities on the Great Lakes (Chicago, Buffalo, Cleveland, Toronto, Milwaukee, and Detroit) came into prominence. All of the early port, river, and Great Lakes cities got a head start on urban growth and continue to be large centers today. The West Coast cities of San Francisco, Los Angeles, San Diego, Seattle, and Portland emerged later as principal centers.

The railroad superimposed advantages on many of the port, river, and lake cities and led to the widespread diffusion of the population in the U.S. and Canada, opening up "gateway" cities such as Kansas City, Omaha, and Fort Worth to westward settlement. Air and highway transportation completed the urbanization process by allowing inland cities such as Indianapolis, Atlanta, Denver, and Dallas to grow to considerable size. And all through these technologically evolving transport eras, manufacturing was the engine of urban growth. A strategic location on the extant water and rail transportation networks meant advantages in moving materials to the manufacturing centers and shipping commodities to market.

All of this has suddenly changed. Manufacturing, after nearly two hundred years of ascendancy as a city-builder, has suffered massive relative and absolute declines in North America, with the centers that specialized predominately in manufacturing undergoing the greatest declines. Almost all new jobs being created today are in some area of services, and the high-paying jobs are in the producer or advanced services, such as marketing, advertising, finance, legal

services, accounting, and other business services associated with large corporations. The point is that all of this advanced service employment has been increasingly dependent upon new communications technology.

We tend to forget today that the initial impact of telephone technology brought about tremendous changes in the way business enterprises conducted their operations and how the social structures of individuals' lives were altered. But the changes engendered by the telephone were insubstantial in comparison with other changes in communications, and especially modern telecommunications. Although facsimile technology existed in the 1930s, it was not commonly used until the late 1980s. FedEx overnight delivery of letters, packages, and boxes began in 1974 but did not come into extensive use until the early 1980s and did not intensify until the mid-1990s. Most major corporations and institutions make daily, routine use of fax machines and overnight delivery.

It is the Internet that has had the greatest, most far-reaching, and most permanent impact on the world economy and the transformations of society, especially in today's advanced world economies of North America, Western Europe, Japan, and Australia. It is a brand-new technological development. The Internet is a whole series of interconnected computer networks, a network of telecommunications connections, sometimes described as a network of networks (Shipley and Fish, 1996). It was only in 1993, when the National Center for Superconducting Applications released the Mosaic Web browser (developed at the University of Illinois at Urbana-Champaign), that academic researchers realized the possibilities available by using the Web. Since then, there has followed the most explosive growth in communications in all of human history. As Castells (this volume) reminds us, "Our historic time is defined by the transformation of our geographic space."

With the transformation from a manufacturing-based to a service-based economy within one generation, and with the telecommunications age superimposed on this new service economy, cities have undergone colossal and permanent change. A few large urban centers have emerged throughout the advanced economies of North America, Europe, and Japan that rightly deserve the standing of "global cities." These are not necessarily the largest urban centers in the world, as Mexico City, São Paulo, Shanghai, Seoul, Calcutta, and Bombay—among the world's ten largest cities—are not deemed global cities. Global cities, instead, include New York, Tokyo, and London at the top of the hierarchy. At a slightly lower level are the global cities of Hong Kong, Singapore, Paris, and Osaka. These large urban centers, as well as others, achieve the designation because of their intense utilization of global interdependent telecommunications, not merely because of their considerable population size. The reason these global cities are set apart is due to the nature of the capitalist activities housed within them, especially major transnational and multilocational corporations, as well as the concentrations of governmental, institutional, and education establishments.

Despite the worldwide possibilities of instantaneous telecommunications via fiber-optic cables and satellites, only a few cities have yet achieved global

status in this early period of the telecommunications age. These are the cities whose economic dominance necessitates a central position on the worldwide Internet. These are the centers that are most intently wired with other global cities. In spite of the geographically emancipating possibilities of electronic telecommunications, only a few places on the earth have in fact developed the communications infrastructure and have the pent-up requirements for widespread information exchange. Rather than creating a system of information flow that is independent of distance, the telecommunications age has instead caused the concentration in only a limited number of places of the sources of information genesis, particularly high-order information and knowledge. These places are the global cities within the capitalist world.

The recent and rapid spread of fiber-optic cables within and among urban areas in the United States and Canada and, more particularly, the explosion in the placement of transoceanic cable lines have significantly increased the speed and efficiency of telecommunications around the globe. Prior to 1993, the number of voice paths across the Atlantic Ocean was greater via satellites than cables. Since then, however, fiber-optic cables with improved light pulse technology in digital computer code have easily eclipsed satellite communications, whose advantage is largely to serve inland and remote locations not yet reached by fiber-optic cable. (Satellites still handle most of the broadcast video.) Most global Internet and telephone messages now flow through hair-thin threads of glass propelled by laser light pulses.

It was not until 1988 that glass fiber started to replace copper telephone signals. The fiber-optic system proved to be overwhelmingly advantageous. In the year 2000, more than 400,000 miles of fiber-optic cable will lie on the ocean floors, enough to circle the earth sixteen times. By the year 2003, more than 600,000 miles of cable will connect some 175 countries and virtually all the major cities of the world. Using lasers that split light into colors, the newest cable crossing the Atlantic ocean can transmit 2.4 million voice conversations simultaneously, and the recently completed cable link with China will handle 4 million at one time. Developing technologies promise even more messages per hairlike fiber, with each cable housing multiple glass fibers.

The current reality and these future developments are astounding in the consequences for telecommunications among global cities and emerging world cities. Whereas inexpensive and instantaneous transmission of routine messages and data can take place worldwide, the limited number of global cities will continue to function as select gathering places—centers of people concentrations—for the necessary face-to-face human interactions required for high-level decision making. Despite the tons of data that can be sent via the Internet, that amount pales in comparison to the volume of information humans provide one another simply by being in one another's presence—with body language, voice, eye contact, handshake, small talk, and so much more. In spite of the worldwide extension of human telecommunications from one's own home or office, human beings have been conditioned to communicate face to face since human speech first developed. Agglomerations of humans will be intensified by telecommunications.

CYBERSPACE AND THE CITY

A significant part of the world's expanding telecommunications matrix, particularly within the economically developed world, is "cyberspace," a term popularized by Gibson's notoriously influential novel, *Neuromancer* (1984). Born out of the microelectronics revolution and the digitization of information, cyberspace loosely encompasses the realm of the Internet and related technologies, a domain in which telecommunications merged with computers to form integrated networks. However, the term is often used casually in other ways and has suffered from its popularity. It is important to note that while cyberspace is large and growing, it certainly does not encompass the broad entirety of telecommunications. Indeed, the most common form of telecommunications, the telephone, frequently utilizes analog technology and often involves communication entirely outside the domain of cyberspace.

Nonetheless, the Internet is incontestably the largest electronic network on the planet, connecting an estimated 100 million people in more than one hundred countries (Warf, 1995), but still less than 2 percent of the world's population. Even more important is the stupendous rate of growth: spurred by declining prices of services and equipment and enormous media hype, the number of users worldwide has doubled roughly every year. From its military origins in the United States in the 1960s, the Internet emerged on a global scale through the integration of existing telephone, fiber optic, and satellite systems, which was made possible by the technological innovation of packet switching and Integrated Services Digital Network (ISDN), in which individual messages may be decomposed, the constituent parts transmitted by various channels, and then reassembled, virtually instantaneously, at the destination. Popular access systems in the United States such as CompuServe, Prodigy, and America Online, allow any individual with a microcomputer and modem to "plug in" to cyberspace. The widespread use of such systems and others forms a fundamental part of what Castells (1996) calls the "space of flows" in which virtually all localities are embedded today.

Considerable confusion about the real and potential impacts of telecommunications on cities in part reflects the exaggerated claims made by "postindustrial" theorists (for instance, Toffler, 1980), which often hinge upon a simplistic, utopian, technological determinism that ignores the complex, often contradictory, relations between telecommunications and urban form. For example, repeated proclamations that telecommunications would allow everyone to work at home via telecommuting, dispersing all functions and spelling the obsolescence of cities, have fallen flat in the face of the persistence of growth in dense, urbanized places. In fact, telecommunications are generally a poor substitute for face-to-face meetings, the medium through which most sensitive corporate interactions occur, particularly when the information involved is irregular, proprietary, and unstandardized in nature. Most managers spend the bulk of their working time engaged in face-to-face contact, and no electronic technology can allow for the subtlety and nuances critical to such encounters. For this reason, a century of telecommunications, from the telephone to fiber

optics, has left most high-wage, white-collar, administrative command and control functions clustered in downtown areas (despite their high rents). In contrast, telecommunications are ideally suited for the transmission of routinized, standardized forms of data, facilitating the dispersal of functions involved with their processing (that is, back offices) to low-wage regions. By allowing multinational firms to stay in contact with their operations around the world, telecommunications have contributed to the centralization of key activities in global cities such as New York, London, and Tokyo, which rely upon their extensive connections to the global telecommunications infrastructure to serve as the nerve centers of the world economy. In short, there is no *a priori* reason to believe that telecommunications inevitably lead to the dispersal or deconcentration of functions; by allowing the decentralization of routinized ones, information technology may enhance the comparative advantage of inner cities (albeit with jobs generally filled by suburban commuters). Telecommunications thus facilitate the simultaneous concentration and deconcentration of economic activities (Moss and Carey, 1995).

Within cities, cyberspace has contributed to a substantial reconstruction of urban space (Graham, 1992ab; Graham and Marvin, 1996), creating a social environment in which "being digital" is increasingly critical to knowledge, wealth, status, and power (Negroponte, 1995). As Graham and Aurigi (1997, p. 26) note, "Large cities, based, in the past, largely on face-to-face exchange in public spaces, are dissolving and fragmenting into webs of indirect, specialized relationships." Information systems such as the Internet may reinforce existing disparities in wealth, connecting elites in different nations who may be increasingly disconnected from the local environments of their own cities and countries. Indeed, in a sociopsychological sense, cyberspace may allow for the reconstruction of "communities without propinquity," groups of users who share common interests but not physical proximity (Anderson and Melchior, 1995). In the age of the "City of Bits" (Mitchell, 1995), in which social life is increasingly mediated through computer networks, the reconstruction of interpersonal relations around the digitized spaces of cyberspace is of the utmost significance.

One increasingly important effect of cyberspace is "telework" or "telecommuting," in which workers substitute some or all of their working day at a remote location (almost always home) for time usually spent at the office (Grantham and Nichols, 1994–95; Office of Technology Assessment, 1995). The self-employed do not count as teleworkers because they do not substitute teleworking for commuting. Telework is most appropriate for jobs involving mobile activities or routine information handling such as data entry or directory assistance (Moss and Carey, 1995). Proponents of telework claim that it enhances productivity and morale, reduces employee turnover and office space, and leads to reductions in traffic congestion (especially at peak hour), air pollution, energy use, and accidents (Handy and Mokhtarian, 1995; Van Sell and Jacobs, 1994). The U.S. Department of Transportation (1993) estimated that 2 million people (1.6 percent of the national labor force) telecommuted one to two days per week in 1992, while the Department of Energy estimated in

1994 that 4.2 million (3.3 percent) did so, a volume expected to rise to 7.5 to 15.0 million (5 to 10 percent) of the labor force by 2002. If this phenomenon grows as expected, it will lead to further decentralization of economic activity in suburban areas.

However, as Graham and Marvin (1996) point out, there are countervailing reasons why telecommunications may *increase* the demand for transportation rather than decrease it. First, while telecommuters spend fewer days at their workplace, it is not at all clear that they have shorter *weekly* commutes overall; indeed, by allowing them to live farther from their workplace, the total distances traveled may actually rise. Second, time freed from commuting may be spent traveling for other purposes, such as shopping or recreation. Telecommuting may alter the reasons for travel, but not necessarily the frequency or volume. Third, by reducing congestion, telecommuting may lead to significant induced effects whereby others formerly inhibited from driving may be induced to do so. In short, the substitutability, rather than complementarity, of telecommunications for commuting is far from clear.

Differentials in access to the skills, equipment, and software necessary to gain entrée to the electronic highway threaten to create a large (predominantly minority) underclass deprived of the benefits of cyberspace (Wresch, 1996). This phenomenon must be viewed in light of the growing inequalities throughout industrialized nations generated by labor market polarization (that is, deindustrialization and growth of low income, contingent service jobs). Modern economies are increasingly divided between those who are comfortable and proficient with digital technology and those who neither understand nor trust it. This development disenfranchises the latter group, denying them the possibility of citizenship in cyberspace. Indeed, those who may need access to such information the most—the poor and relatively powerless—may have least ability to purchase or use it. Despite the falling prices for hardware and software, basic entry-level machines for Internet access cost less than roughly $1,000, an exorbitant sum for low-income households. For employees in poorly paying jobs that do not offer access to the Internet at work, the obstacles to access are formidable, including cost and lack of familiarity with computer systems. Even within the most digitized of cities there remain large pockets of "off-line" poverty (Thrift, 1995; Resnick and Rusk, 1996; Sawicki and Craig, 1996; National Telecommunications and Information Administration, 1995).

Like other telecommunications systems such as the telephone or Geographic Information Systems (Pickles, 1995), the Internet is a social product, interwoven with relations of class, race, and gender and the formation and transformation of communities, and inevitably subject to the uses and misuses of power (Jones, 1995; Shields, 1996). A growing body of critical literature has detailed how electronic systems are used to monitor everyday life, including credit cards, visas and passports, tax records, medical data, police reports, telephone calls, utility records, automobile registration, crime statistics, and sales receipts (Lyon, 1994). In this light, the Internet is more akin to Foucault's famous panopticon that surveys and controls all it sees than to some mythical unfettered frontier region. The unfortunate tendency in the popular media to

engage in technocratic utopianism has largely obscured these power relations. *Contra* the postindustrial utopian perspective popular with the mass media, social categories of wealth and power are inevitably reinscribed in cyberspace.

TELECOMMUNICATIONS AND INDUSTRIAL SPACE

While the role of technologies in urban space has generally led to the refortification of the existing urban hierarchy, their impacts on industrial space are far less clear. Traditionally, the role of technologies in industrial space was examined by focusing on the behavior and locational dynamics of high-tech manufacturing industries (Markusen, Hall, and Glasmeier, 1986). The picture is far more complicated today, as telecommunications serve as a basic infrastructure for every industry with various technological components. The spatial dynamics have become particularly complex when industrial networks cross international borders and when extensive use of telecommunications infrastructure is required for frequent coordination between parts suppliers or client firms.

Amid the possibilities offered by back offices, electronic cottages, and telecommuting, the past few decades have seen further concentration of advanced producer services in global cities, suburbanization of mass production assembly plants, globalization of various sectors from footware to semiconductors, and formation of highly specialized industrial districts of networked variety. Thus, on the one hand, telecommunications technologies have offered an enormous opportunity for decentralization of industrial activities at regional, national, and international levels; on the other hand, we continue to observe the emergence of specialized agglomerations, and particularly in such functions as corporate headquarters and research and development (R&D), high-tech manufacturing, and advanced producer service functions.

In most instances, the widely advocated "death of distance" did not result in dismantling of specialized industrial districts and manufacturing agglomerations. In fact, agglomeration has become a new focus of research, not simply as a pervasive phenomenon, but also as an important source of competitive advantage. By minimizing high transaction costs for innovation, firms can compete more effectively through forming agglomerations. Alternatively, firms can induce innovation more effectively through agglomerating.

In analyzing competitiveness of industries, economists have placed increasing attention to geographical perspectives. The rebirth of interests was most recently induced by Paul Krugman (1992), whose contribution includes an effort to integrate geographical perspectives into economic paradigms. However, there are numerous critical spatial issues that the economists either neglect or fail to acknowledge as influential factors in production functions. The issue of agglomeration and its relationship to innovation is one of these issues. Some contend that innovative activities are promoted by knowledge spillovers, which are typically contained and occur within a selected region. Only a limited set of regions is able to form an "innovative milieu" (Castells, 1985) or "territorial innovation complex" (Stohr, 1985). These millieux

emerge based on a particular mix of government policy, industrial organization, and technical skills. More recently, attention has been placed on the social and regional cultures on which industries are founded, emphasizing territorially embedded relationships between innovation and entrepreneurship (Saxenian, 1994). Others emphasize firms' locational decisions that are increasingly based on climate and cultural amenity for employees. Despite differences, they all agree that innovative activities are not readily transferred across space: in the United States and elsewhere, it is clearly evident that high-level manufacturing and R&D functions are still located in or near high-order metropolitan areas, and evidence shows no trend toward massive decentralization. The unequal distribution of innovative activities highlights the spatial disparity of high-technology industries, and serves as a key indicator for regional growth.

Similar to innovations being restricted within certain geographical space, new industries continue to concentrate in large metropolitan areas. New industries of the 1990s, such as information services, are seen agglomerating at the core of the metropolitan economy. However, they are also rapidly growing in rural areas. As Beyers shows (Chapter 11), information-related industries are growing faster in rural America than in cities. Although face-to-face contacts continue to play an important role in business transactions, the use of telecommunications technologies has broadened their export base. These information merchants have largely managed to acquire and maintain clients at distant locations, in part because of the specialized nature of their product and service delivery. Thus the emerging spatial patterns of new industries are fundamentally different from the classic notion of time-space convergence, partly because the current patterns of expanded markets for many industries are based on heightened levels of specialization both for supply and demand. The market demand has become increasingly segmented, and the suppliers have correspondingly become specialized and niche-market-oriented. These supply-and-demand conditions can take place at far greater distances through telecommunications infrastructure.

These new trends bring us to a new hypothesis on the relationship between firms and space. Rather than economic efficiency, corporate strategies, and innovation-driven locational decisions of firms, is location increasingly a factor that drives economic efficiency, corporate strategies, and innovation? The importance of spatial dynamics in today's economy involves far-reaching effects both at the regional and international levels. No doubt telecommunications technologies have expanded options for locational choices for industries. They have also expanded the potential market size for companies, from local to international. The success of the Internet bookstore, Amazon.com, is a prime example of technologies expanding the market size. Yet the most sought-after locations remain industry-specific, and firms are faced with increasing competition from out-of-state and out-of-the-country competitors.

The specialization of activities and resulting reconfiguration of industrial space pose a serious challenge to regional policy makers. Not only are regions faced with a continuous updating of physical and technological infrastructure,