HOW TELECOMMUNICATIONS SYSTEMS ARE TRANSFORMING URBAN SPACES

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INTRODUCTION

All too often, telecommunications systems are treated as an alternative to transportation systems, as a substitute for the physical movement of people and services. The growing use of telecommunications systems is doing far more than influence where people work and live, but is actually changing the character of activities that occur in the home, workplace, and automobile. This chapter examines the way in which information and telecommunications are transforming everyday urban life; making the home into an extension of the office, shopping mall, and classroom; allowing the automobile and airplane to become workplaces; and converting the office building into a hub for social interaction and interpersonal contact. The diffusion of information technologies drastically increases the complexity of cities by increasing the number and type of interactions among individuals, firms, technical systems, and the external environment. Information systems are permitting new combinations of people. equipment, and places; as a result, there is a dramatic change in the spatial organization of activities within cities and large metropolitan regions.

Telecommunications has made the fundamental elements of urban life – housing, transportation, work, and leisure – far more complex logistically, spatially, and temporally. Despite the rapid integration of information and telecommunications into everyday life, our theories and policies rarely consider the role of information technology in urban growth and development. In this chapter, we explore the way in which new information and telecommunications systems are altering the structure of urban development in the United States.

For the past century, cities have sought to control land use and guide economic development by designating areas for distinctly different types of activities. The zoning regulations that govern most cities and suburbs reflect the industrial-era value placed on the separation of activities into distinct zones for residential, commercial, and industrial uses. Tire dirt, dust, and fumes from factories led to concern for public health that imposed restrictions on where manufacturing activities could occur. With the advent of the electric streetcar, commuter railroad, and the automobile, it becarmr possible to develop residential comunities far from the industrial portions of cities.

As we enter the twenty-first century, telecommunications technologies are transforming the mix of activities within the home, office and automobile in ways that are only beginning to be recognized and understood. We have invested far more resources to study the influence of transportation systems on urban development than to understand the relationship of telecommunications technologies to urban and regional growth. The popular and academic literature on new information technologies reflects a long-standing belief that electronic communications will lead to the economic decline of cities as they make it possible to replace the face-to-face activities that occur in central locations. More than a quarter century ago, Ronald Abler (1970), a pioneer in the study of communications and urban space suggested that:

> [A]dvances in information transmission may soon permit us to disperse information-gathering and decision-making activities away from metropolitan center, and electronic communications media will make all kinds of information equally abundant everywhere in the nation, if not everywhere in the world.

George Gilder (1995) extended this argument when he wrote that: "we are headed for the death of cities" due to the continued growth of personal computing and distributed organizations advances. Gilder further

claimed that: "cities are leftover baggage from the industrial era." By this reasoning, cities are no longer needed to access a wide range of cultural activities and information sources, because telecommunications can bring the library, concert hall, or business meeting into any home or office.

Peter Gordon and Harry W. Richardson (1997), of the University of Southern California, have argued that communications technologies are reinforcing the movement out of cities that the automobile had initiated: "Rapid advances in telecommunications are now accelerating the decentralization trends set in motion by the advent of the automobile." They contend that: "Proximity is becoming redundant… Entertainment already is, and instruction is more likely to be, transmitted over broad-band radio frequencies rather than seen in traditional theaters or lecture halls, today's cities continue to become less compact; the city of the future will be anything but compact." Most observers believe that technology will eliminate the need for cities as centers of interaction. The leading media guru, Nicholas Negroponte (1995), has stated that "[T]he post-information age will remove the limitations of geography. Digital living will include less and less dependence upon being in a specific place at a specific time, and the transmission of place itself will start to become possible." Even the concept of the "edge city," a label that Joel Garreau (1991) applied to clusters of suburban office parks linked bevy freeways, is a reflection of how both transportation and communication technologies are treated as forces that have fostered the outmigration of work and housing from the central city.

Admittedly, geographers such as John Goddard, Jean Gottman, Allen Scott, and James Wheeler have carefully analyzed the way in which telecommunications can both centralize and decentralize activities, reflecting geography's concern for understanding communications technology and the location of human activities. Gottmann (1983) proposed that communications technologies work in two directions by making it possible both to concentrate and to disperse economic activities, and had a "dual impact" on office location: "First, it has freed the office from the previous necessity of locating next to the operations it directed; second, it has helped to gather offices in large concentrations in special areas." The authors of this paper have also, succumbed to this spatial imperative and emphasized the role of technology in reinforcing the position of major cities in the United States. (Moss and Townsend, 1996, 1997, 1998)

Nigel Thrift (1996) provided a new rationale for face-to-face contact in an era of high-speed communications by claiming that telecommunications networks were generating a demand for instant information in the financial services sector that was best done in a face-to-face context. Thrift argued that the principal function of major financial centers is interpreting in real time the massive amounts of information that are generated each day: "Since the international financial system generates such a massive load of information, power goes to those who are able to offer the most convincing interpretations of the moment." Interpreting information depends as much on face-to-face interaction as on advanced technologies, an activity that is necessarily and increasingly centralized in the leading world financial centers.

A NEW APPROACH TO TELECOMMUNICATIONS RESEARCH

While telecommunications technologies are certainly a space-adjusting phenomena, the emergence of the Internet, the growth of mobile telephony, and the diffusion of new information technologies are doing far more than merely rearrange the spatial pattern of activities in cities and metropolitan regions. New telecommunications systems are redefining the fundamental elements of modern urban society – the office, the automobile, the home, and the street – and generating a need for a new conceptual framework to understand the way in which telecommunications systems are influencing the character of activities in cities and metropolitan regions.

Simply put, telecommunications systems have progressed faster and deeper into our society than the theories we use to guide research on such technologies. Michael Batty (1997) states: "the city itself is

turning into a constellation of computers." Batty highlights the way in which new information systems are "generating new opportunities for understanding and planning cities," and makes a powerful case for a new approach to the study of cities that builds upon the "synthesis of computers and telecommunications." As he states:

> [C]omputers which were once thought of as solely being instruments for a better understanding, for science, are rapidly becoming part of that infrastructure, and thus affecting space and location. In one view, the line between computers being used to aid our understanding of cities and their being used to operate and control cites has not only become blurred but has virtually dissolved. In another sense, computers are becoming increasingly important everywhere and the asymmetry posed by their exclusive use for analysis and design in the past and their all pervasive influence in the city is now disappearing. In both cases, the implication is that computers will have to be used to understand cities which are built of computers.

In recent years, new theoretical empirical studies have offered insights into the way in which information systems are influencing urban activity patterns. Jed Kolko has suggested that telecommunications has led to the "death of distance" but not the "death of cities." He also found that "city size is positively related to domain density, and significantly so" (Kolko, 1998). Daniel Sui has proposed the need for new urban models that reflect an "organic view of cities based upon analogies in biology" and that emphasize that "cities are formed more from local actions without centralized planning or macro control " (Sui, 1998). The growth of electronic communications is also forcing changes in how we think about regions, according to Harvey and Macnab. They assert that "the fundamental geographical notion of the region" is in need of a temporal overhaul and ask "to what degree will traditional east-west channels…give way to north-south alignments more in keeping with the time of day?" (Harvey and Macnab, 1998).

This chapter makes a simple argument: the deployment of new telecommunications systems is altering the activities that occur in the key elements of urban society – the home, the office, the automobile, and even the hotel room and public parks and streets. Telecommunications systems are blurring the separation between the home and the workplace, radically changing office design and function, transforming the automobile into an extension of the workplace, and moving street crime into the shadows of cyberspace.

TELECOMMUNICATIONS AND THE WORKPLACE

The modern office building is the single greatest human artifact explicitly designed to generate, process, and manage information. The merger of computers and telecommunications systems has profoundly altered the physical design of office buildings and the type of activities that occur within them. At the macroscopic level, new office buildings increasingly feature advanced telecommunications infrastructure built into their walls and floors to accommodate the growing use of data and video transmission equipment. For large financial institutions, the floorplate of a building has become the critical factor, as large floor areas are required for modern trading rooms where hundreds of traders are situated in close proximity to each other. In cities such as New York and London, many older office buildings arc unable to meet today's technological requirements, generating a demand for new buildings that can meet today's spatial and technological requirements. As a result, Canary Wharf in the London Dockyards and the World Financial Center in New York City's Battery Park City have attracted leading financial institutions to areas that are not contiguous to the city's traditions financial district.

At the same time, there is also a new emphasis on interior office design that eliminates the physical boundaries within offices in order to promote human interaction. Francis Duffy (1969) was the first to observe that modern office buildings are increasingly designed to accommodate the face-to-face exchange of information through meetings, conferences, and informal conversations at the water cooler.

As Duffy states, "Office work is generally becoming more mobile, more complex, and more plural. And yet there is often the need for some concentrated, individual work in the same place. This has led to one of the eternal conflicts in office design: the need to accommodate communication and interaction as well as individual work" (Duffy, 1998). Firms such as IBM (Young, 1993) have reduced the size of individual office and rely on flexible office assignments such as "hot-desking," but there is simultaneous a greater emphasis on the use of conference rooms and centers for mobilizing workers, encouraging interaction, and bringing experts together to work in team efforts.

Telecommunications technologies have also influenced the scale and mix of activities that occur within office buildings. The modern office building has remained the epicenter of electronic and face-to-face communication by adapting to new technological requirements and organizational priorities only through investments in new equipment, which have dramatically expanded the buildings' information-processing capabilities. An example of such modernization is the New York Information Technology Center, a 400,000-square-foot building in Manhattan's financial district that was previously the headquarters of an investment bank. Although the building stood empty for years, in 1995 it was totally renovated with new telecommunications systems and has become a center for New York's multimedia industry (Conway, 1997).

While technological innovation has strengthened the role of the office building in certain areas of the financial sector, it has also led to the dispersion of routine and retail financial services. Nowhere is this more apparent than in the consolidation of local banks into interstate banking companies and the replacement of the local branch offices with automated teller machines (ATMs). Retail banks, once built to resemble elaborate temples in order to reassure depositors that their savings were safe and secure, are no longer defined by real estate but by electronic networks. This has led many communities to protest the loss of the locally owned and managed bank, while also hastening the spread of 24-liour banking into local communities through the supermarket, drugstore, and gas station.

Of even more significance, banks now operate solely in electronic space rather than physical space. Three Internet banks, Security First Network Bank and Atlanta Internet Bank offer 24-hour service at their Websites, and a third, CompuBank, opened in mid-1998. These banks may be the harbinger of banking in the future; an activity once confined to a distant physical building in the geographic center of a community that can now be conducted from a terminal anywhere in the world. However, these new ways of banking presuppose access to and literacy in information technology and telecommunications, which are lacking in many poor inner-city and rural communities.

Another place-based activity, the auction market – whether in rare art, commodities, or financial instruments – has traditionally relied on face-to-face contact that took place in specific cities and at specific times. Telecommunications has totally disrupted the traditional physical marketplace in which goods are bought and sold. For example, the auction of tea leaves, an activity based in London for more than three hundred years, can now be conducted wherever tea is grown – in Sri Lanka, India, China. and Africa – as a result of advanced telecommunications systems. Electronic trading in futures and options is being done through a global network that links the Chicago Mercantile Exchange, the Paris Bourse, and the Singapore International Monetary Exchange and will eventually replace the traditional "open outcry" system, in which buyers and sellers shout out bids on the crowded floor of an exchange.

Even the secretive world of buying and selling art has adapted to telecommunications. More than seven hundred art dealers are linked to ArtNet, an online service that allows potential buyers to see collections online and to compare prices, a previously impossible task. Jacob Weisberg notes that "the Web will expand the art market not only by spreading information but also by making art info a more liquid asset" (Weisberg, 1999). The potential growth of the art market through electronic auctions does not mean that cities will decline as centers for culture, but that the world of art, like the world of finance, will soon be

driven by information, and that those people and places with the skill and capacity to participate in the electronic flow of art will benefit greatly. If history is any guide, explaining, interpreting, and conveying information about the art market will soon be as valued as the production of art itself.

THE HOME ENVIRONMENT

Just as the office environment has been influenced by telecommunications technology, the home is undergoing a fundamental change in its function and design as a result of new telecommunications technologies. Information has traditionally been delivered to the home through a single telephone line, broadcast radio and television, and by hand (whether delivered by mail carriers or newspaper delivery personnel, or carried in by the residents). For much of the last one hundred years, the home has functioned primarily as a site for social-emotional functions of the family, explicitly designed as a refuge from the workplace. A relic of Victorian-era philosophers, this separation of home and work appears to be disappearing as new information technologies are becoming widely available.

Information brought into the home through satellite dishes, coaxial cable, and high-speed phone lines dramatically expands the number and type of activities that can occur within the confines of a residence. According to a recent study by the US Department of Labor (1998), more than 21 million Americans did some part of their primary job at home in 1997, and more than half of those used a computer for their home-based work. For many small businesses and self-employed individuals, personal computers equipped with modems, reliable overnight deliver services, sophisticated voice mail systems, and the proliferation of neighborhood office centers such as Kinko's have allowed the home to become the firm's headquarters, workplace, and distribution center. In Manhattan, San Francisco, Chicago, and Boston, underutilized industrial structures have been converted into combined "work-and-live space" with advanced telecommunications systems to serve home-based workers.

The capacity to extend the workplace into the home has generated new demands for high-speed telephone lines in the home. Home contractors now treat telecommunications infrastructure as the equivalent of "electronic plumbing," and new homes are being equipped with high capacity phone conduits to accommodate information services. Electrolux has even developed an Internet-connected refrigerator with an LCD touch screen and bar-code scanner that could be used to order groceries over the Web. New housing developments across the United States are being marketed to sophisticated buyers, based on the speed of their Internet access and services available through their own intranet. A developer of townhouse and single-family housing in the Washington, D.C., metropolitan area offers Local Area Network (LAN) wiring as an option in all new homes it constructs, at a price of $1,500 to $2,000 (Tueting, 1997).

The diffusion of new information-based services in the home – for security, climate control, and entertainment – has led a consortium of semiconductor, computer, and telecommunications companies to develop a "Shared Wireless Access Protocol" that would interconnect electronic devices within the home using the same technology employed by cordless telephones. Even low-income communities are participating in the information explosion in the house. In Oakland, California, the Acord complex, a 206-unit housing project, is equipped with fiber-optic cables, computers in each home, and a learning center for job training.

Public services, once provided solely within designated public buildings such as schools, libraries, or prisons are now also being provided in the home, albeit for different reasons. For example, tire growth of "home-schooling" has been facilitated by the Internet; an estimated 1.2 million children now learn at home, and in California there is a California Homeschool Network that links home-schooling parents. Amazon.com even has a link for home-schoolers on its Web site. At the same time, many government agencies have adopted advanced technologies remotely to monitor parolees as a way to control costs. The

home has evolved into a site for the incarceration for nonviolent offenders. Electronic bracelets simply activate a modem to contact corrections officers when a convict attempts to leave his or her home.

In the twenty-first century, a home's attractiveness will be judged by the speed of its dial-up connections and extent of its intelligent infrastructure, rather than conventional measures such as the number of bedrooms or bathrooms. John Chambers, President of Cisco Systems, believes that "everything" in the home will be connected to the Internet – not just electronic devices, but the piano, the fireplace, the window blinds (Beiser, 1999). According to some experts, it will even be possible to create "rooms or environments where humans can interact with otherwise inanimate objects and machines;…consumers will be able to turn their homes into full-fledged intelligent environments" (Patch and Smalley, 1998). Clearly, the movement of information into the home will expand its role in the economy, allowing all members of a household to participate in a wide array of different economic and social functions and making the home far more than a site for housing family members.

TELECOMMUNICATIONS AND TRAVEL

Wireless telephony has transformed transportation and travel across the world, converting the automobile, the hotel room, and even the airport into an information-intensive infrastructure. It is conceivable that telecommunications will eventually make the automobile commute into a productive part of the workday, once it is possible to send and receive e-mails, faxes, and telephone calls from any street or highway. "Hands-free" voice recognition technology should overcome many of the safety concerns about mobile phones. Traffic jams and congestion may even be tolerated as a chance to catch up with telephone messages and e-mail. Traffic congestion may even intensify in cities and suburbs, as the automobile evolves into a communications as well as transportation device.

There are a variety of new technological innovations that have been designed to take advantage of the automobile's new role. Traffic information, once delivered by radio stations, is now a commercially available service provided by mobile phone in many metropolitan areas. Subscribers can even purchase customized traffic reports on their routes in Southern California. And in the State of Washington, a demonstration project is testing a voice-activated computer, the AutoPC, that provides instant traffic information to cars equipped with this technology (A. Reid, 1998 and Whitely, 1999).

However, information technology is also being deployed to assist motorists eager to make face-to-face contact with drivers they identify on the freeway. Traffic Gems, a company in Long Island, New York, provides subscribers with a bumper sticker that contains an e-mail alias so that motorists who want to meet a fellow driver can visit the Traffic Gems Web site, find out more about other subscribers, and e-mail a message (Slayton, 1998). When the automobile was first invented, it was commonly called a "horseless carriage," but with information technology, it has become possible to do far more in a car than one could do in a horse-drawn carriage.

PUBLIC LIFE, PUBLIC SPACES, AND TELECOMMUNICATIONS

Cities have often been defined by their great public spaces, where people meet and share common experiences, whether in a stadium, a cathedral, or even a music club. Telecommunications systems are gradually affecting even the activities and events that occur in those distinctly urban settings. For example, the capacity to download music from Internet sites may soon diminish the recorded music industry but could invigorate nightclubs and concert halls, where live music is produced. Telecommunications technology makes is possible for every club and concert hall to be a site for transmitting music over the Internet to audiences around the world.

Airports and hotels are also being transformed into centers for information-based activities so that travelers can conduct business while waiting for flights or during layovers. A company called Laptop Lane rents offices, phone lines, and equipment to air travelers in several major airports across the United States. Similarly, hotels now recognize the need to provide their guests with access to sophisticated information infrastructure. At the Ritz-Carlton Hotel in Kuala Lumpur, there is an on-call "technology butler" to provide high-tech support to business travelers. Hotel chains are increasingly providing a variety of telecommunications services, ranging from "virtual offices" in each hotel room to computing kiosks in public areas/ The hotel room, once a place to rest, has also become a place to do business.

The character of urban street life is also changing due to the deployment of communications technologies by law enforcement agencies and criminal organizations. Telecommunications has always been an important tool in law enforcement but a broad array of new technologies is increasing the effectiveness of crime prevention and prosecution. New geographic information systems being used to map and identify crime-prone locations, and remote surveillance cameras being deployed to monitor drug dealing in many cities are widely used in many urban precincts. In Redwood City, California, the police are able precisely to identify the location of gunshots with a new system of directional microphones connected by phone lines to a central computer. In St. Louis, police cars are equipped with laptop computers so that police can rapidly obtain information about suspects and perform live scanning of fingerprints without using a radio dispatcher as intermediary.

Perhaps the most innovative use of new telecommunications has been by drug dealers and prostitutes who increasingly use beepers, Web sites, and mobile phones lo conduct their lousiness transactions. In big cities, drug dealers rely on beepers to receive requests from purchasers and can avoid selling drugs in public places by using mobile phones to arrange deliveries.

Telecommunications is also converting the "streetwalker," the oldest urban profession into an online industry. Web sites such as www.redlightnet.com allow prostitutes to advertise their services and to reach customers without leaving their home. While the actual service may entail interpersonal contact, the negotiation over price and schedule can be done electronically, off the streets. In New York City, street level prostitution is reserved for the low-cost provider and customer. Surely, prostitutes will never be eliminated from city streets, but the emergence of erotic Web sites and online sex is diverting some of tire traffic that might once have frequented adult entertainment districts in large cities. While this may be an improvement in the "quality of life," it is not clear how tourists will respond to such changes in urban street activity.

CONCLUSION

This chapter has sought to provide an alternative perspective on how scholars can study the effects of telecommunications in cities and metropolitan regions. The information-based city is increasingly differentiated from previous urban forms by its extensive and interconnected networks for moving information. Unlike previous upheavals that followed the advent of large-scale technological innovations such as factory-based mass production or the interstate highway system, the transformation of the metropolis is being driven by the diffusion of intelligence and awareness (via technology) across many components of urban life. Telecommunications technologies are changing the character of activities in the office, home, automobile, and even the street. This essay has identified – at a very preliminary level – the need to expand our research on telecommunication so that we can understand how commuting, the home, work, and even public spaces are being affected by new telecommunications systems.

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