

# Why Cities Will Thrive In The Information Age

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Information technologies will be the principal force shaping economic development in the 21st century. During the previous century, the auto was the dominant technology – giving rise to low-density communities beyond the boundaries of the central cities, suburban shopping malls, and ultimately to a new form of development: the edge city. In the 21st century, the convergence of telecommunications and computing technologies and reductions in the cost of transmitting and processing information will transform the fundamental elements of urban society: the office, the home, the hotel, the automobile, the factory, even the restaurant and warehouse. This paper explores the ways in which information technologies will shape cities in the 21st century and the challenges that such technologies pose for urban and regional development.

## **Information Infrastructure Will Drive the Growth of Cities**

During the past 200 years, the pattern of urban development in the United States has evolved from one based on waterways to one based on railroads, highways, airports – and now, the Internet. And, as illustrated by the accompanying map of the long-distance fiber systems, the emergence of the Internet is leading to a new information infrastructure designed to move information at high speeds among major U.S. metropolitan regions.

Although telecommunications and information systems pervade our everyday life, we don't yet fully understand how such technologies will shape the growth of cities and regions. Unlike the automobile, which led people and jobs to disperse, moving outward from central cities, information technologies have dual effects: as the geographer Jean Gottmann has observed, these technologies sometimes weaken the economic forces that bind urban activities; in other cases, they strengthen the metropolitan bond by spurring new investment in offices, entertainment complexes, and housing. Moreover, the demand for access to new telecommunications technologies is leading to massive investment in the information infrastructure of office buildings, hotels, residential structures, and even stadiums and airports in our major metropolitan regions.

For real estate developers, the automobile, in combination with the interstate highway system, opened new areas for housing, recreation, and offices, while simultaneously creating new requirements for parking, truck delivery, vehicular access, and environmental management. But the basic elements of the passenger automobile – the internal combustion engine, the reliance on a single human driver, and even the rearview mirror – have not changed substantially over the past century; in contrast, new telecommunications technologies are subject to rapid innovation and diffusion. Moreover, where the public sector played a strong role in guiding the transportation system (for example, through the development of the interstate highway system), the telecommunications infrastructure is being financed and deployed principally by private entities. (Often the only evidence that a particular telecommunications route is being planned is a spray-painted mark on the street and a request to the locality to permit the construction of a trench.)

Digital technologies have brought dramatic changes to the office environment: it is hard to believe, but two ubiquitous features of office life – the personal computer and the fax machine – were uncommon as recently as two decades ago. Now that cell phones and Palm Pilots are standard issue for information workers everywhere, it is almost impossible not to be "connected" to the workplace. New developments in information technology will generate both opportunities and challenges for property managers and real estate developers, who will need to recognize and anticipate technological trends to ensure the competitive position of commercial, industrial, and residential property.

## The Internet Will Remain an Urban Creature

The Internet, which was initially developed to facilitate scientific communication, has emerged as the most powerful communication system in the United States; not only has it drastically affected other media – print, radio, and television – but it also influences the way we shop, bank, and spend our free time. Contrary to popular notions, access to and use of the Internet is not evenly distributed across the United States or the world. In fact, numerous studies have highlighted the spatial concentration of Internet activity in a relatively small number of metropolitan regions.

Internet use and development can be measured and tracked in several ways. In 1998, an analysis of the Internet backbone systems in the United States revealed that a group of ten metropolitan areas – Atlanta, Chicago, Dallas, Denver, Houston, Los Angeles, New York, San Francisco and the Silicon Valley, Seattle, and Washington, D.C.-accounted for 60.5 percent of the total national backbone capacity in the United States.<sup>1</sup> A study by Jed Kolko at Harvard University identified ten leading regions of commercial Internet usage: Boston, Chicago, Dallas-Ft. Worth, Los Angeles, Miami-Ft. Lauderdale, New York, Philadelphia, the San Francisco Bay area, Seattle, and Washington, D.C.-Baltimore.<sup>2</sup>

A 1999 report issued by the Silicon Valley Network identified eight regions that have emerged as "Internet clusters where talent, capital, educational institutions and other resources convert ideas into companies": Austin, Boston, Los Angeles, New York, San Francisco, Seattle, Silicon Valley, and Washington, D.C.<sup>3</sup> Clearly, a region's capacity to take advantage of the Internet depends on the presence of other information-based industries and institutions. What is striking about the growth of Internet clusters is the dominance of the coastal states.

A 1999 Yahoo survey of the "most wired" metropolitan regions in the United States drew upon a multiplicity of methodologies. On the basis of just one component of the Yahoo measurement system-the number of Internet hosts per capita – the leading metropolitan regions were Jacksonville, Minneapolis-St. Paul, Oakland, Orlando, Phoenix, San Francisco, San Jose, Tampa-St. Petersburg, Seattle, and Washington, D.C.<sup>4</sup>

Whatever the measurement tool, these studies offer compelling evidence that the Internet is fostering a new hierarchy of U.S. metropolitan regions and reinforcing the competitive position of those areas that have a strong mix of educational institutions, information-intensive industries, and a technologically skilled labor force. Admittedly, by enabling them to serve new markets in distant locations, the Internet has benefited many small establishments in rural areas. Nevertheless, the overall pattern of Internet development favors metropolitan regions that have the necessary information capital and technological infrastructure to develop new products and services that are electronically produced and distributed.

It is essential to recognize that the increased use of information in all aspects of our economy has serious implications for cities and regions in the United States. The new information economy favors those regions with a technologically skilled workforce, information-intensive industries, and a climate that favors innovation and creativity in the use of new technological systems. It is no longer possible to sustain economic development with a large workforce, a good harbor, or low taxes. Instead, the Internet is strengthening those metropolitan regions that have the right mix of connectivity and creativity as well as direct access to broadband communications and strong air travel service. We are witnessing the rise of cities that specialize in air cargo and of regions that are major centers of Internet activity. Proximity to an airport as well as to Internet

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<sup>1</sup> Mitchell L. Moss and Anthony M. Townsend, "The Internet Backbone and the American Metropolis" (Bloomington, Ind.: The Information Society, School of Library and Information Science at Indiana University) vol. 16-2000, no. 1, pp. 35-47.

<sup>2</sup> Jed Kolko, "The Death of Cities! The Death of Distance! Evidence from the Geography of Commercial Internet Usage" (paper presented at the Cities in the Global Information Society Conference, Newcastle-upon-Tyne, England, November 22-24, 1999).

<sup>3</sup> Joint Venture: Silicon Valley Network, "Internet Cluster Analysis," San Jose, California, 1999; <http://www.jointventure.com>.

<sup>4</sup> Yahoo Internet Life, "America's Most Wired Cities and Towns," 1999; <http://www.zdnet.com/yil>.

backbone systems is vital for the location of new information-based industries, but in the new century, human infrastructure – a highly skilled workforce – will be as important as the information and transportation infrastructure.

## Have Bits, Will Travel

In less than 20 years, wireless communications have become an essential part of our daily lives. There are 400 million users of wireless communications in the world today; by 2002, there will be 1 billion. During the next three to five years, the development of "third-generation" mobile devices is expected to result in the rapid diffusion of handheld Internet terminals. Mobile phones that incorporate high-speed Internet access will allow workers to be free from their desks yet in constant communication with clients and colleagues. As personal digital assistants (PDAs) become more common, coordinating schedules on the basis of information on the Internet and obtaining real-time access to financial markets will be simple matters.

Advances in cellular technologies and the development of microbrowsers based on a wireless application protocol are making it possible to display Internet content on small screens. Until recently, mobile telephony was used primarily for voice telephone messages, but the Internet will soon be fully accessible via wireless communications as well. As Donaldson, Lufkin & Jenrette note, "the Internet is too vital to remain restricted to the desktop. Widespread mobile Internet usage has been thwarted by poor bandwidth on wireless networks, but these drawbacks are showing signs of fading."<sup>5</sup> Indeed, the Strategis Group predicts that by 2004, 50 million people in the United States will use mobile devices for E-mail connectivity and approximately 4 million will use them for Internet access.

With the growth in mobile connectivity, e-commerce is giving rise to m- (that is, mobile) commerce. It won't be long before we choose a ski resort, make a hotel reservation, purchase movie tickets, and even order take-out meals by means of mobile computing systems that we'll carry in our pockets. Massive upgrades in information infrastructure, however, will be necessary before businesses can handle such transactions.

Most transportation researchers regard the automobile as no more than a means of getting to work or other destinations. But the car has the potential to be far more than just a transportation device: the combination of PDAs and mobile telephony will transform the automobile into an information hub equipped with computer monitor, fax machine, and cellular telephone. Automobile manufacturers are developing communications systems that will transform trucks and autos into a portal for the Internet.<sup>6</sup> New voice recognition systems will give drivers access to computers and allow E-mail to be delivered through an automobile's audio system. As commuting time becomes productive time, being stuck in traffic may cease to be a source of stress and frustration and may become a valued part of the day – a time to retrieve and send E-mail, to trade in financial markets, and to accomplish other personal business. By making auto travel more of an extension of the workplace – making longer commutes possible and extending the metropolitan region to once-remote locations – the mobile computer may be contributing to urban sprawl.

## A New Form of Latent Demand: Connectivity

Transportation planners have long been concerned about what's known as latent demand – pent-up demand for travel. Technological advances may not only be catering to this demand but also unleashing a new form of it: the demand for connectivity. As the per-bit cost of electronic transmission continues to spiral downward, use of the Internet and other advanced telecommunications services will increase exponentially. In the words of a recent study:

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<sup>5</sup> Donaldson, Lufkin & Jenrette, "Wireless Data: The Coming of Age on the Mobile Internet" (New York: Donaldson, Lufkin & Jenrette, May 12, 2000).

<sup>6</sup> Jacques A. Nasser, Ford Motor's chief executive, quoted in Robyn Meredith, "Very Soon, Drive Time Can Become Work Time," *New York Times*, January 16, 2000: "We will do nothing short of transforming our cars and trucks into portals for the Internet."

As new technologies such as optical transport have rapidly reduced the cost of bandwidth or the price of Internet access and data services, both business and consumer demand for network access has skyrocketed. As the amount of communications bandwidth increases, new applications are developed that consume the bandwidth, creating a vicious cycle that drives the demand for Internet infrastructure.<sup>7</sup>

What are the implications for cities and large metropolitan regions? Clearly, manufacturing and retailing will rely more on time and speed than on space. just-in-time manufacturing and distribution systems will create a demand for new high-tech factories and warehouses, typically located near major airports or interstate highways. It is no accident that L.L. Bean has built a new warehouse next to the Bangor, Maine, airport – or that Trammell Crow's new warehouse structures, on the grounds of the Portland International Airport, have the capacity to simultaneously load and unload directly from four 747 jet planes and 68 large trucks. A few figures can help put into perspective the magnitude of the coming changes: according to a study by the Center for Energy and Climate Solutions, "by 2007 e-commerce may prevent the need for 1.5 billion square feet of retail space and 1 billion square feet of warehouse space."<sup>8</sup>

Reductions in the cost of communication have increased the incentive to make greater use of Internet-based advanced information systems. Broader use of these systems has led, in turn, to the development of customer help centers and Web-hosting centers in major metropolitan areas that have access to high-speed Internet backbone systems and an ample supply of technologically trained workers. The buildings that house Webhosting centers are essentially technologically intensive warehouses. Because their operations require high levels of safety and security, the buildings themselves are most notable for their lack of markings and signage.

## Intelligent Environments

Many futurists predict that because technology is making it possible to work from remote locations, electronic communications will eliminate the need for offices. What these forecasters fail to recognize is that the latest and most sophisticated information technology is typically deployed first where there is a large concentration of sophisticated information users: in office buildings, research labs, and specialized design and manufacturing facilities. Property owners and real estate developers who want to provide their tenants with the latest in information technologies confront a complex set of challenges:

- The construction of high-speed communications systems in hotels, housing, and commercial establishments
- The capacity of the vertical risers in office structures to accommodate optical fiber
- Tenants' preference for large floor plates for technology-intensive distribution facilities
- The security requirements for computer and data centers
- The need for multiple points of entry for telecommunications carriers
- The revenue from leasing rooftop space to communication carriers.

One of the most exciting areas of current research is the development of "intelligent environments," in which computers – including vision- and voice-recognition systems – are actually built into the walls of a room. John Brown, head of Xerox's Pale Alto Research Center, argues that technology should disappear into the fabric of the working environment. For example, the walls of a meeting room would be electronically linked to workers

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<sup>7</sup> Goldman Sachs Investment, *Research, Technology: Issue and Outlook 2000*, January 2000.

<sup>8</sup> Joseph Romm, "The Internet Economy and Global Warming" (Annandale, Va.: Center for Energy and Climate Solutions, December 1999); <http://www.cool-companies.org>.

located anywhere in a corporation. Desks would have smart in- and out-baskets that would scan documents and monitor workflow.<sup>9</sup>

Xerox has already launched an experiment in which a coffeepot linked to the Web sends out a message when fresh coffee is brewed, drawing staff to the coffee area, where an electronic wall facilitates the discussion of ideas over coffee.

It is certainly possible to foresee the day when every part of a building will offer electronic connectivity: you'll arrive at work and the lobby walls will immediately download all your incoming messages to a mobile computer that you carry in your pocket. Meetings will be set up by computer systems that coordinate the schedules and locations of all those who need to attend. And as you move through the day, all messages and calls will be automatically delivered through a system of intelligent walls and rooms, no matter where you are in the building. Investment in information infrastructure is not limited to office buildings. Although for most of the past century, the home was considered a refuge from the workplace, new information technologies are creating an expanding web of connections between home and work. Those same technologies can enable household members to manage appliances and utilities, to monitor the location of family members, and to access various electronic media.

Today, information is brought into the home through coaxial cable, direct broadcast satellite systems, and modems attached to telephone lines. The merger of AOL and Time-Warner, along with AT&T's entry into the cable market, means that advanced, high-speed communications will soon be available in most homes through cable television systems. At the same time, digital subscriber lines will provide high-speed access to the Internet through a residential telephone line.

What are the implications for property owners and developers? In the near future, a house may be judged by the speed of its telecommunications service and the quality of its internal information infrastructure, not just by the number of bedrooms or proximity to a good school system. A showcase Internet home built in the United Kingdom, for example, included 72 Internet connections, four high-speed Internet telephones, and Web-cams to monitor security and the nursery.

### **Old-Fashioned Networking Still Matters**

Despite the growth of electronic communication, there is no substitute for face-to-face communication. In fact, as more and more information is being transmitted electronically, settings that can provide opportunities for face-to-face encounters have taken on new value. Much of what we do depends on the interpersonal cues and subtle nonverbal messages conveyed during informal conversations – at the water cooler, over coffee, at lunch, and on the golf course. The rise of the meeting and convention business – and of cities that specialize in accommodating such events – demonstrates the continuing importance of direct human contact. Clearly, the challenge for developers is to ensure that the design of interior office spaces can accommodate both advanced electronic communications facilities and spaces that support human interaction.

What is striking in the age of the Internet is the rise of specialized places where people can gather to exchange information directly. As demonstrated by the demand for conference and meeting rooms, hotels that are in large cities or near airports have become information hubs. In fact, the hotel cocktail lounge has become one of the most active settings for people to meet, talk, and even conduct business.

The emergence of "convention cities" such as Orlando and Las Vegas, is further evidence of the fact that in an era of electronic information, cities can flourish as high-volume meeting places where disparate groups gather to share gossip and expertise and to maintain personal connections. Even resorts – built around golf courses or ski slopes – can become "business information hubs" where the physical setting is designed to offer

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<sup>9</sup> Michael H. Coean, "Design Principles for Intelligent Environments" (Cambridge: MIT Artificial Intelligence Lab, 1998).

opportunities to exchange the sort of information that cannot flow through a cable or over the electromagnetic spectrum.

British architect Frank Duffy has argued that office buildings should incorporate "club space" that can accommodate informal meetings and spontaneous interaction among colleagues. At the headquarters of Bloomberg LP, in Manhattan, there are no private offices – just partitions separating workspaces – and only the founder and chairman has a private meeting area. Conference rooms are adjacent to an area where employees can mingle – and snack on a continuously replenished supply of food and beverages.

Even the newly resurgent Times Square area in midtown Manhattan can best be understood as an example of a new type of office district. Below the new office towers that house firms such as Condé Nast and Bertelsmann are a series of theme restaurants that serve both tourists and office workers. At the end of the workday, the ESPN Zone restaurant is jammed with professionals who meet for hours, talking and watching sports events. In places such as Manhattan, Washington, D.C., and Silicon Valley, restaurants are not places to dine but settings in which business is conducted, from dawn to dusk, by various industries, each with its own set of favorite establishments. The importance of human interaction in today's information economy has strengthened the appeal of localities that can offer settings conducive to informal and unplanned encounters, where the latest ideas and trends – whether in finance, fashion, entertainment, or computer software – can be disseminated and absorbed. For office developers, recognizing the importance of high-speed communications is not enough: it is equally important to provide physical and social settings that can meet the demand for direct personal interaction.

### **The Coming Challenge**

Information technologies are shaping the form and function of urban regions in the United States. Cities and regions that adapt to the new technological and human requirements of the information economy will grow; others – still hinged to the industrial economy of the late 19th and early 20th centuries – will wither away. In an age of information, those cities and metropolitan areas that are capable of meeting the demand for environments that are conducive to communication—whether face-to-face or electronic – will be the ones to flourish in the years ahead.

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