TELECOMMUNICATIONS TECHNOLOGIES AND URBAN DEVELOPMENT: STRATGIES IN U.S. CITIES

John B. Horrigan, Ph.D.
Pew Internet and American Life Project
1100 Connecticut Ave, NW Suite 710
Washington, DC 20036
202-557-3465 (voice), jhorrigan@pewinternet.org

Robert H. Wilson
Mike Hogg Professor in Urban Policy
LBJ School of Public Affairs
University of Texas at Austin
Austin, TX 78712
(512) 475-7906 (voice), 475-7909 (fax), rwilson@mail.utexas.edu

Abstract**:** Telecommunications systems have become a critical component of today's economy. The rapid pace of technological change in telecommunications and its pervasive effect economic geography complicate our understanding of this evolving industry and its potential for development strategies. Since the demand for telecommunications services is positively correlated with urban size, a substantial impact on cities and urban form is expected. One question that emerges is whether cities can successfully formulate strategies likely to make them more attractive sites for telecom-intensive businesses. The role played by information and telecommunications in the emerging economy is discussed followed by consideration of the impacts of telecommunications on economic geography, particularly in cities. Then two specific questions are examined. First, are cities developing telecommunications strategies that complement existing economic specialization, for example in manufacturing, or targeted and emerging industries? Second, what role will telecommunications advances play in efforts to promote dense downtown development aimed at the New Economy?

The paper finds that cities are developing "social network" strategies to economic development that seek to develop a critical mass of innovative ideas and direct capital to those new ideas. The social network strategies are tailored to existing economic strengths that, city development officials hope, can be enhanced by new communications technologies. The social network strategies are also tightly linked with programs to promote dense downtown development, suggesting that in some places the New Economy may revitalize central city areas. Urban patterns will likely be rearranged, but cities, as clusters of innovation, will remain as the primary centers of economic activity for some time.

Keywords: Internet, development strategies, center city revitalization, telecommunications

1. Introduction

Telecommunications systems have become a critical component of today's economy. The importance of the telecommunications industry derives not only from its size and rapid growth but also its impact on virtually all industries. The information technology industry, defined as the manufacturing of electronic hardware (e.g., computers and semiconductors), communications equipment, communications services, and software, generated value-added of $680 billion in the United States in 1998, up from $347 billion in 1990 (U.S. Department of Commerce, 2000). Moreover, information technology contributed to one-quarter of economic growth in the United States from 1992 to 1997 (U.S. Department of Commerce, 2000). Although the size of the U.S. market greatly exceeds that of most countries, high rates of growth in demand for telecommunications services are found throughout the world. The Internet segment of this industry is believed to have reached 375 million users worldwide by the end of 2000 and is forecasted to reach 490 million users in 2002. By then $400 billion of commerce will be conducted on the World Wide Web (Computer Industry Almanac, 2001; International Data Corporation, 2000).

The rapid pace of technological change in telecommunications and its pervasive effect on economic geography complicate our understanding of this evolving industry and its potential for development strategies. Since the demand for telecommunications services is positively correlated with urban size, a substantial impact on cities and urban form is expected. One question that emerges is whether cities can successfully formulate strategies likely to make them more attractive sites for telecom-intensive businesses. Urban development strategies have, in the past, often focussed on manufacturing but are now slowly adapting to the growing importance of services. But telecom affects virtually all economic sectors and cities may be able to design policies that link telecomm to existing economic specializations.

This paper will explore the opportunities presented by the Internet and advanced telecommunications technologies for urban development. The role played by information and telecommunications in the emerging economy will be discussed followed by consideration of the impacts of telecommunications on economic geography, particularly in cities. Then two specific questions will be examined. First, are cities developing telecommunications strategies that complement existing economic specialization, for example in manufacturing, or targeted to emerging industries? Second, what role will telecommunications advances play in efforts to promote dense downtown development aimed at the New Economy? The answers to these questions are derived from fieldwork in five North American cities-Austin, Cleveland, Nashville, Portland, and Washington, DC-on local development strategies involving telecommunications and the New Economy. To conclude, the paper will re-examine the development potential of information technology on cities, especially supply side issues, and alternative policy approaches for realizing this potential.

~~A.~~2. Infrastructure for the Information Economy

For several decades, fundamental economic change has been driven by technological innovation and liberalization of international trade in countries throughout the world. A prominent and

visible impact of this process can be found in economic restructuring. The broad pattern of restructuring involves declines in shares of employment, gross national product, and international trade in manufacturing sectors and increases among the service sectors of most national economies. The telecommunications sector itself embodies major elements of contemporary technological change but also satisfies the important demands for information and its exchange embedded in this economic restructuring (Bell, 1973; Machlup, 1962; Innis, 1950; Innis 1951; Porat, 1977). The growing importance of information creates a crucial role for telecommunications in that it is the infrastructure that most efficiently transports information, as will be discussed below.

The economist Joseph Schumpeter wrote about historical periods of great technological change (Schumpeter, 1934). He noted that during earlier technological revolutions, such as the periods when steam power or electricity were introduced, traditional sectors declined as new economic sectors rapidly expanded. A similar pattern is evident in today's economy. The advanced economies in the United States, Europe, and Japan demonstrate a relative decline in the share of the workforce in the manufacturing sector (Wilson, 1993). Although subsectors of manufacturing show strong growth, including information technology products, the rapid growth of employment in services predominates.

Using the US economy for illustrative purposes, the broad group of service sectors has tended to register rapid growth whereas growth rates of particular subsectors have shown substantial variation, resulting from differences in the nature of demand and in the progress of technological innovation across subsectors (Wilson, 1993). Distributive services, which incorporates public utilities, transportation services, and communications, have demonstrated solid growth in total output but technological change has made the sector more capital intensive and produced slow employment growth. Retail trade and consumer services have also demonstrated quite moderate growth in terms of employment. In contrast, health and education services and producer services, consisting of financial, professional, and business services, have grown quite rapidly.

Even though service sector firms, such as distributive and producer services firms, may improve the productivity in non-service sector firms, much attention has been focussed on productivity in service sectors themselves. The diversity in production technology across service subsectors leads to some variation in productivity, but as a group, productivity growth in services has tended to lag other sectors, especially manufacturing. The capital-intensive service sectors, such as the transportation and telecommunications services, have substantial potential for productivity gains, but most services sector firms have less potential as a result of their high labor intensity. Nevertheless, telecommunications systems hold great potential for increasing productivity in many service sector firms.

In addition, economies of scope are being encountered in many of the telecommunication networks. Airline reservation systems link to hotel and car rental reservation systems. Telecommunications systems developed by firms to manage oil production and transportation and to operate electric utilities have provided opportunities for these firms to enter new markets by providing communications services to other firms. High capacity access to residential dwellings, through cable or fiber optic systems, creates the possibility for a multitude of services,

including telephone, entertainment, Internet access, and utility management, to be offered through the same system and again creating potential for the realization of economies of scope.

Virtually all types of firms and industries require telecommunications services, but the work of Porat can be used to identify sectors of the US economy that purchase a relatively high share of inputs from the telecommunications sector. Telecommunications-intensive sectors include finance and insurance, business services, computer and data processing, real estate, wholesale and retail trade, and hotels (Wilson, 1993). These tend to be rapidly growing sectors and produce services. It is interesting to note that firms in these sectors are relatively spatially concentrated in larger cities—in U.S. cities such as Atlanta, Chicago, Dallas, Los Angeles and New York—and this concentration of intensive users is leading to the provision of superior telecommunications infrastructure in these cities (Schmandt, Williams, Wilson, and Strover, 1990; Greenstein, Lizardo, Spiller, 1997).

3 Impacts on Economic Geography and Development

Periods of great technological change generate significant impacts on the spatial distribution of economic activities and urban structure. Impacts are frequently linked to changes in transportation systems. The transition from animal-drawn wagons to railroads or from railroads to automotive transportation brought great change to patterns of urban growth. It is true that railroads and later highway exchanges could reinforce the earlier advantage of a port city; the new types of transportation infrastructure generated opportunities for other locations. The precise impact of the new technology, however, depends on its unique characteristics and its most efficient utilization. Furthermore, the location decisions and the resulting impact on urban growth depend on a number of factors in addition to transportation expenses. Finally, the opportunities afforded by new technologies will not be simultaneously recognized nor appreciated by all individuals who play a role in location decisions. As a result, the diffusion of new technology across space is a time-dependent process.

3.1 *Decentralization versus Concentration*

The new telecommunications infrastructure lowers the cost of transporting information from one location to another, which location theory suggests should lead to a more spatially dispersed pattern of economic and urban growth. The empirical test of this hypothesis, however, is problematic for the reason mentioned above. Multiple factors affect location decisions and these factors are subject to change as is the cost of transportation. Nevertheless, potential impacts can be explored conceptually.

The declining cost of transportation observed in recent decades has tended to generate more spatially dispersed patterns of economic activity. The decline in prices for telecommunications services should also contribute to greater decentralization since no particular location will benefit from substantially lower prices (Hepworth, 1990). The location of telemarketing firms, which make intensive use of telecommunications services, reflects this principle. In the US, telemarketing firms are often found in small towns or rural areas of the mid-West at great distances from the markets they serve. The Internet-based companies, such as Amazon.com, can also eliminate the need for physical proximity to customers. The broad class of businesses that

delivers its product or service in a digitized form is also less likely to require physical proximity to customers. Since the telecommunication expenses of these businesses will not vary significantly across the country, location decisions of firms become more sensitive to the costs of other factors of production, such as labor costs.

Another school of thought believes telecommunication and face-to-face interaction are not necessarily substitutes, but can be complements (Moss, 1998). Electronic access to ever-increasing quantities of information may lead to the need for additional face-to-face interactions, and vice versa. The face-to-face interactions perform a mediating function where individuals mutually benefit by comparing or contrasting their understanding or analysis of the vast quantity of information available to them. As a result, additional information actually leads to the increasing need for face-to-face interaction. Observing the historical impact of the introduction of the telephone and other transportation changes, not only did workers no longer need to live near their place of work, but the telephone also facilitated the concentration of a large number of offices in center cities. Urban office locations tend to facilitate face-to-face interaction. If this pattern holds, the new telecommunications systems may even enhance importance of urban locations for some types of interactions or businesses.

Evidence from the US provides some support for this latter view. The dramatic increase in air travel for business activities and attendance at business meetings and conventions suggest the continuing, if not increasing, need for face-to-face meetings. Significant decline in the cost of travel has contributed to the increase, but if telecommunications were truly a substitute, there should be less demand for business travel and face-to-face meetings. This trend is consistent with the view that information- intensive, telecommunications-based interaction and face-to-face interaction are not always substitutes but complement each other in some circumstances.

The effect of telecommunications systems on economic geography remains to a certain extent a question of speculation and in need of further study. With advances in teleconferencing, face-to-face interactions may increasingly not require physical proximity. Very important questions concerning the actual utilization of the new technologies make forecasting difficult. Nevertheless, judging from earlier periods when new types of infrastructure revolutionized economic geography, similar in scope to the contemporary period, it is likely that both centralizing and decentralizing patterns among different types of activities will emerge in the current period (Mandeville, 1983).

3.2 *Impacts on Cities*

Cities have historically performed important communications functions in roles such as commercial, cultural, or governmental centers or nodes in transportation networks. The performance of these functions was location dependent in that a physical presence of participants in the city was necessary. Many believe that the telecommunications revolution will lead to the death of cities by eliminating the need for a physical presence and spatial proximity and thus remove the limitations of geography for many functions (Moss, 1998).

Within a city or metropolitan region, the telecommunications innovations allow for economies of scale in many activities. The example of banking is instructive. The widespread use of ATM

machines and the ever more popular on-line banking eliminate or reduce the need for branch banks. Although this technology may require fewer employees in aggregate, the spatial impact is likely to be the relocation of workers to fewer locations in a metropolitan area even though banking services will be more spatially ubiquitous.

A study of urban telecommunication in the US revealed that the most advanced services were found in the largest cities where the greatest demand for such services, from producer service firms and corporate headquarters, exists. The greater access in urban areas is related to the technology; advanced services require more powerful switches and often, high capacity lines. These systems are expensive and are likely to be built where they would be most fully utilized. It is true, however, that new technology can be rapidly diffused down the urban hierarchy (Salomon, 1996). Switches have become smaller as computers become more powerful and distributed networks reduce the need for very expensive centralized facilities. Wireless communication systems should make the diffusion process among smaller cities and even rural areas even more rapid.

Increasingly the constraining factor in the development of telecommunications systems is bandwidth, which refers to the capacity of transmissions facilities. For transmission of digitized video images or large volumes of data, considerable bandwidth is required. At present, only fiber optic and co-axial cable systems can provide bandwidth necessary for such transmissions. Attempts to expand the capacity of copper systems have found some success and the development of wireless systems with high bandwidth is a high priority. But for the time being, transmissions requiring very high bandwidth are largely dependent on high capacity links to fiber optic systems, which are most frequently available in larger cities (Moss, 1998). The fact that fiber optic systems have yet to be extended to users in smaller cities and rural areas reinforces the attractiveness of large cities where high capacity systems are available.

Globalization has generated a unique urban form, the so-called global city. At the top of this international urban hierarchy are New York, Tokyo, and London and a second tier contains such cities as Calcutta, Frankfort, Los Angeles, Mexico City, Paris, São Paulo and Singapore (Sassen, 1994). The location patterns of corporate headquarters and producer services, including such services as advertising, accounting, legal, and financial services, represent an interesting case of the complementarity between abundant information and face-to-face interaction. These cities are critical not due to their size but to their role as nodes in international systems of commerce, including for the command and control systems of transnational corporations.

Further technological innovation may reduce the locational advantages represented by the advanced telecommunications systems found in large cities. Although innovation will continue to first appear in larger cities, diffusion of the innovation through the urban hierarchy will likely be increasingly rapid. However, considerable evidence exists on the continuing need for face-to-face interactions for certain types of exchanges suggesting the continuing importance of large cities where specialized human capital is found.

4. Description of cities

The five cities studied in this report have a variety of characteristics, with several being among the most highly wired cities in the United States (Austin, Portland, and Washington, DC), some being centers of high-tech manufacturing (Austin and Portland), others being service oriented (Nashville and Washington), and one traditional manufacturing center (Cleveland). The following tables present portraits of the five cities.

Table 1 Population and Internet indicators for case study cities.

	Internet Penetration Rates at home or work (% of adults) (2000)	Internet Penetration Rates at home or work (% of adults) (1999)	Population (2000)	Population Growth in percentage ('90-'00)	Median Age in years (1999)
Washington, DC	**73**	**71**	**4,815,581**	**14.1**	**33.5**
Austin	**69**	**64**	**1,186,279**	**40.2**	**30.2**
Portland	**61**	**57**	**1,870,730**	**23.5**	**34.7**
Nashville	**50**	**50**	**1,187,521**	**20.6**	**33.5**
Cleveland	**48**	**42**	**2,217,174**	**0.7**	**33.5**

Table 2 Economic Structure of Cities (% Employment in Each Sector, excluding Public Administration)

SECTOR	Year	Con-struction	Manu-facturing	Distrib-utive Services	Sales (Whole-sale + Retail)	Producer Services	Health & Educa-tion	Other Services
Cuyahoga County	**1987**	**3.9**	**25.2***	**5.4**	**27.2**	**15.4**	**12.2**	**10.7**
(Cleveland-Lorain-Elyria, OH)	**1997**	**3.4**	**19.3***	**4.8**	**25.8**	**22.1**	**14.9**	**9.7**
Davidson County	**1987**	**7.1**	**16.6**	**6.8**	**29.2**	**15.7**	**12.0**	**12.6**
(Nashville, TN)	**1997**	**5.4**	**10.9**	**7.2**	**28.1**	**19.2**	**16.1**	**13.0**
District of Columbia	**1987**	**2.8**	**4.3**	**5.5**	**16.7**	**29.2**	**17.7**	**23.8**
(Washington, DC)	**1997**	**1.6**	**3.1**	**5.0**	**13.6**	**31.8**	**21.6**	**23.2**
Multnomah County	**1987**	**3.7**	**15.5**	**10.1**	**29.3**	**19.1**	**10.6**	**11.8**
(Portland-Vancouver, OR)	**1997**	**5.2**	**13.2**	**8.9**	**27.1**	**22.1**	**12.7**	**10.8**
Travis County	**1987**	**5.6**	**15.4****	**4.3**	**30.4**	**22.0**	**7.7**	**14.6**
(Austin-San Marcos, TX)	**1997**	**5.5**	**16.2****	**4.2**	**26.6**	**26.9**	**10.1**	**10.6**
United States	**1987**	**5.8**	**22.7**	**6.1**	**28.9**	**15.0**	**10.2**	**11.3**
	1997	**5.3**	**18.0**	**6.0**	**27.9**	**18.9**	**13.1**	**10.8**

* Percentage of employment in machinery was approximately 13.0 % in 1987 and 10.4 % in 1997.

** Percentage of employment in electronic and other electric equipment was approximately 3.9 % in 1987 and 7.7 % in 1997.

Data Source: County Business Patterns, "http://fisher.lib.virginia.edu/cbp/"

As the tables show, Washington has the highest Internet penetration rate, with 73% of adults with Internet access, followed closely by Austin at 69% and Portland with 61%. Cleveland (48%) and Nashville (50%) have the lowest Internet penetration rates of the five cities (Scarborough Research, 2001). By the end of 2000, overall Internet penetration in the United States for adults was 56% (Pew Internet and American Life Project, 2001). In terms of distribution of employment, Cleveland, Austin, and Portland lead the way in manufacturing, with Austin and Washington leading in producer services followed by Cleveland and Portland. Washington's high share of "other services" is accounted for by the many membership organizations located in the U.S. capital. Nashville rates very low in manufacturing, but relatively high in health care services and education.

Although not disaggregated in Table 2, Austin and Portland are known as centers of manufacturing in electronics, with Austin specializing in semiconductors, computers, and semiconductor manufacturing equipment (SME), and Portland in semiconductors, SME, displays, and silicon wafers. The Washington, DC metro area, another tech center, specializes in telecommunications and Internet services. In 1997, overall high-tech employment location quotients (with high-tech sectors defined as computer and electronic manufacturing, software publishing, information services and data processing, and computer systems design) were 3.5 for Austin, 2.2 for Washington, D.C., and 2.0 for Portland (Cortright and Mayer, 2001). Making causal statements about economic structure and Internet penetration is risky, but it seems that Austin, Portland, and Washington have high Internet penetration rates because of a workforce accustomed to being very wired. That is, because people's jobs produce the infrastructure for the information economy and use it in production processes, they demand such products for themselves at home.

5 Case Study Results

For the field research on the cities discussed below, interviews were conducted with economic development officials in the public and private sectors, entrepreneurs in the cities, city officials, and community leaders, to assess the thrust of cities' response to the impact of the New Economy and new communications infrastructure on the cities (Horrigan, 2001).

5.1 *Information Infrastructure and the City*

Although the Internet is a global communications medium, the network that enables it places physical burdens on cities. As America has become an increasingly wired nation, the wires that carry Internet data and computer hardware that routes it have begun to be noticeable parts of urban landscapes. The most common manifestation of this is in street cuts—digging trenches along cities' rights-of-way so that high capacity fiber optic cable can be built out to businesses and homes. Cities have very little control over street cuts; the federal Telecommunications Act of 1996 requires cities to allow all new competitors to lay necessary infrastructure, so street cuts and lane closures are simply a fact of urban life for many city dwellers.

A second Internet infrastructure phenomenon is the telehotel, which is a facility that houses switches, routers, and servers for telecommunications carriers or Internet service providers.

Telehotels are not quite on-ramps to the information superhighway, but more like airports providing gates where airlines collect and discharge passengers. Like airlines, different types of "data movers" demand different numbers of gates. A large telecommunications carrier such as AT&T or MCI might have sufficient demand to build its own airport—a telehotel just for itself. An Internet service provider might only need a few gates, or rooms at the telehotel, to route traffic onto high-speed trunk lines. A dot-com that ships content over the Internet might need to rent only a little space at the telehotel.

If not built by large telecom carriers, telehotels are frequently conceived as real estate projects. That is, real estate developers purchase an existing office building, retrofit it to house telecommunications equipment, and then rent space in the telehotel to telecom carriers, ISPs, or other companies whose data needs require room in a telehotel. Real estate developers are banking on the Internet axiom that data traffic will expand to fill existing bandwidth capacity. The hope is that Internet companies, whether business-to-business or business-to-consumer ecommerce firms, will choose to locate near telehotels, or that non-Internet firms with large data needs (e.g., financial institutions) will set up operations nearby.

Telehotels are an urban phenomenon because they need to be located near abundant bandwidth. The reasons are technical; communication signals degrade over distance so they need the boost a switch provides. Telehotels also require a lot of space, buildings with high ceilings and sturdy construction, excellent cooling systems for the equipment, and plentiful and reliable electric power. Old department stores fit this bill nicely. They are spacious, have high ceilings, wide-open floor space, and are fairly easy to retrofit as homes for communications equipment.

In the five cities studied here, telehotels have revealed themselves as double-edged swords for cities trying to capture the Internet's economic possibilities. On the one hand, telehotels should serve as a magnet for companies that rely on the Internet to reach customers or sell an electronic product. Moreover, since many Internet and multimedia firms prefer to locate in the downtowns of cities, telehotels' need to be in the downtown matches dot-com workers' desire to be there. The other hand for telehotels is their lifelessness. They house floors and floors of telecommunications and computer equipment, but take very few employees to run. Telehotels therefore do not rate well as economic drivers, given the paltry number of people they employ. They also take up a great deal of valuable urban space that might otherwise be available for companies that employ lots of people and give the downtown life.

Cities have a limited number of tools at their disposal to manage telehotels. In Cleveland, the city council passed an ordinance requiring that the first floor of all buildings in the downtown area be available for retail stores. The ordinance was passed with telehotels explicitly in mind, as one developer planned to retrofit the landmark May's Department store building into a telehotels. In Portland, which prides itself on discouraging urban sprawl, the city already requires retail on the first floor of downtown buildings. City officials can only watch with concern as several downtown buildings become telehotels, taking away office space that the city would prefer be used for more employment-intensive businesses that they would rather not see locate in the suburbs. In Washington, DC, the city placed a moratorium on telehotels development in a warehouse district. This part of town, known as NoMa (north of Massachusetts Avenue), is targeted for mixed use for residences and businesses—with

multimedia firms being the business anchor of NoMa. District officials did not want valuable warehouse space purchased for telehotels before plans to make NoMa a thriving multimedia district had a chance to take hold.

5.2 *Smart Growth*

A prominent theme in urban planning in recent years has been "smart growth", that is, efforts to encourage development of downtown areas in cities that support a variety of activities, such as retail stores, office buildings, residences, and culture. In many places, space is the driving force behind "smart growth" initiatives. Growing cities have clogged roads and sprawling suburban areas are losing their allure; downtown development can keep people off the roads. Many cities also have open spaces in their downtown—perhaps old warehouse districts—that are relatively inexpensive to develop.

While not inherently connected to the Internet and the new economy, smart growth and dot-com economic development initiatives are often closely coordinated. One reason has to do with the preferences of dot-com entrepreneurs. Internet start-ups are generally small firms, often single proprietorships. Unlike electronic hardware manufacturers, they do not need sprawling research or manufacturing facilities, so dot-coms can easily be accommodated by office buildings. Dot-com entrepreneurs also see themselves as "urban people", wanting the bustling scene of a city.

In four cities studied here, smart growth initiatives have been tightly linked to dot-com economic development efforts. Portland's "creative services" building in the city's Pearl District stands out as an example of encouraging dot-com business development while channeling growth to a particular place in the downtown. Creative services refers to a cluster of industries whose missions are to design and produce content that is delivered over a variety of electronic media, such as CD-ROMs or, increasingly, the Internet (Oregon Creative Services Alliance, 1999). A public relations firm is an example of a creative services business, as are the film and advertising industries. According to analysis done by the Portland Development Commission, creative services represent a growth industry for the city, with job growth in the sector about twice the growth rate of all other jobs and wages in creative services higher than in other fields.

Many creative services jobs are located in Portland's already well developed downtown, and city officials do not want the jobs to flee to the suburbs. In response, the city, at the cost of $6 million, is rehabilitating an old warehouse building in the Pearl District, which is adjacent to the downtown, to provide office space and high-speed Internet connections to tenants. The Pearl District is in the midst of "yuppifying" with restaurants and residential units springing up in it. By reinforcing the trend with the creative services building, Portland hopes the Pearl District becomes a "cool" urban place that attracts young minds to the area.

Austin's "digital downtown" constitutes that city's program to make its downtown attractive to Internet entrepreneurs while also discouraging sprawl. The city has offered $52 million in incentives to three large high-tech companies—Intel, Vignette, and Computer Sciences Corporation—to build headquarters buildings in the downtown. The hope is to create a critical mass of technology firms and workers that, in combination with Austin's live music scene in the downtown area, will help Austin build on its status as a center of high-tech innovation. Since

Austin prides itself on environmental protection, and because traffic congestion is a growing problem, the "digital downtown" is very much a quality of life issue. By preserving Austin's quality of life, many Austinites believe that the city's strong economic performance of recent years will be sustained.

In Nashville, the scale of smart growth is smaller than in other cities, but the idea much the same. An area near railroad tracks in the downtown know as "The Gulch" is being developed for residential units and office space for dot-com companies and young biotechnology firms. The Gulch is near an existing warehouse office building called Cummins Station that already houses an incubator for Internet start-ups. By promoting what city economic development officials call a "dynamic urban environment", city officials hope that Nashville's cachet as a "hip" place to be will grow, thereby attracting bright young innovative minds to the city.

The final initiative, in Washington DC, is very much in the formative stages. Known as NoMa, for an area north of Massachusetts Avenue near the U.S. Capitol, the objective is to rehabilitate some of Washington's few warehouses so that they can serve as office space for Internet start-ups. As the same time, the city will also encourage development of residential units in the area, and also coordinate with a local arts organization to promote the area as an arts district. Since many dot-com business ideas rely more on creativity than technical sophistication, attracting artists is seen as a way to gather the best creative minds to Washington. The initiative already has one anchor Internet tenant, XFM Satellite radio, and one government agency, the Bureau of Alcohol, Tobacco, and Firearms, will also locate in NoMa. For NoMa to be attractive as a residential place, a new subway station will have to be built. Because this will take time, potential payoffs to the NoMa project are far out into the future.

5.3 *Economic Development Organizations*

In many cities, economic development programs have traditionally connoted "smokestack shopping" whereby city and community leaders dangle financial incentives to lure a factory to the region. This type of strategy has not disappeared in the high-tech era, as cities still vie for semiconductor and computer manufacturing facilities and campus-like research parks. However, with the increasing focus on entrepreneurship as a driver to economic growth, traditional economic development strategies—if not supplanted completely in the Internet era—have been supplemented by new ones that try to promote social networks.

Portland offers a good example of the social network strategy that is being employed to stimulate the demand for business ideas and aggregate the supply of capital to fund them. The Oregon Entrepreneur's Forum, which is headquartered in Portland, has grown in membership from 100 in 1997 to about 1,200 people today, much of the growth coming from dot-com entrepreneurs in Portland. The main service the Forum offers to its members are "meet and greet" networking opportunities. As the entrepreneur's forum has grown, financiers in Portland have established the Portland Angel Network to serve as a focal point for directing start-up funding to promising new companies. Although the network is not oriented solely to dot-com start-ups, Internet ideas receive a great deal of attention. The Portland Angel Network has played a role in the state's Venture Oregon and Angel Oregon conference that is held annually and brings promising ideas and investment funds together. In 2000, the conference disbursed $39 million in start-up funds.

Nashville has initiatives similar to Portland, with the Nashville Chamber of Commerce having established the Nashville Technology Council as a forum for Internet entrepreneurs to come together. The Nashville Technology Council's monthly forums have been well attended, reflecting a pent-up demand for networking activities in Nashville among dot-com entrepreneurs. Most business plans for Nashville dot-coms focus on the health care services and music industries, two prominent parts of the city's economic base. Just as Portland has created a network for angel financiers, Nashville has tried to do the same thing. Nashville business leaders hope not only to provide money for start-ups, but also to educate wealthy Nashville business people, who did not make their money in technology, about investment opportunities in the new economy. However, the Nashville initiative, called the Technology Funding Alliance, has been a victim of the decline in share prices for dot-coms. The Technology Funding Alliance kick-off was initially scheduled for January 2001; it has been postponed indefinitely.

In broad terms, Portland and Nashville are entrepreneurial places that are trying to direct capital to start-ups through the networks mentioned. Cleveland, as hub of large manufacturing firms, has less of an entrepreneurial business culture, and is therefore trying to create a welcoming climate for entrepreneurs while at the same time increasing the pool of capital for start-ups. Through the Northeast Ohio Software Association and its Seed Capital Initiative, as well as through "high tech happy hours" to bring entrepreneurs together, Clevelanders are trying to make the city a more welcoming place for Internet start-ups. Through the Cleveland Growth Association, economic development leaders are specifically trying to target business-to-business ecommerce. In this way, the city's "new economy" economic development strategy is tailored to its existing economic structure.

Austin's economic development challenges in the new economy center more on managing growth than creating new entrepreneurial or capital networks. Relative to the other places studied, capital availability is not a problem in Austin. Wealth generated by Dell Computers has created an abundant pool of start-up capital. Homegrown venture capital firms such as Austin Ventures and Triton are additional sources of funds, and growing investment opportunities in Austin have attracted out of town venture capitalists to Central Texas. As noted above, smart growth is Austin's principal development strategy, relying on maintaining Austin's livability and "hipness" factor as a way to sustain economic growth.

A notable characteristic of these entrepreneurial and angel finance networks is their reliance on physical interaction. Although the business plans of most of the companies interested in such forums rely on cyberspace, the process of getting them off the ground seems unavoidably tied to face-to-face contacts. Moreover, these contacts are being fostered in an organized fashion in the cities studied. Whether the social network approach to economic development pays off is uncertain. But it seems more likely to reinforce existing regional patterns than fundamentally change them.

5.4 *Government Initiatives*

The "smart growth" initiatives discussed above all rely on government leadership and resources—usually in the form of tax incentives—to move forward. However, local

governments have undertaken other programs to shape the Internet's impact on the community. Most of the programs involve promoting access to the Internet for cities' low-income populations.

Cleveland's Digital Vision coalition is an example of how a group of grass roots technology activists successfully lobbied for government funding to support Internet access in community development corporations (CDCs). The coalition began by holding a conference of national leaders in the community technology movement, hoping to increase the profile of the issue in Cleveland by demonstrating how other cities have successfully encouraged Internet access. In the end, the coalition persuaded the city council to devote $3 million cable franchise fees to "computer boot camps" in CDCs in the city. Because several CDCs have had several years of experience in providing Internet access in their neighborhoods, Cleveland has some models on which to build with the new funding.

Austin has also been a leader in providing local government funds for community access projects. The Austin Free Net, established in 1995, is run by a city employee, and the city contracts with the Free Net to support computers in several libraries. The city also has a Community Technology Initiative that provides a $200,000 grant for workforce training in computer and Internet skills, in hopes of alleviating the shortage of workers in the information technology sector. In addition, the city is launching the Grant for Technology Opportunities Program (GTOPs), a $100,000 initiative to give a number of small grants to non-profits and other community groups for Internet projects.

Earmarking funds and creating new Internet-related programs is not, however, very common in the cities studied. More often local governments' participation in Internet programs comes in in-kind contributions to projects funded by the U.S. Department of Commerce's Technology Opportunities Program (TOP). In Nashville, for example, there is very little activity by the Metro government to support community-computing initiatives. However, a group of citizens with the Nashville Neighborhood Alliance, in partnership with the Metro Planning Department, won a $477,000 TOP grant for a "Designing a Community Online" project to improve computer access for neighborhood groups and putting more of Nashville's public information online. With the Planning Department's in-kind contribution, the project's total cost will be $1,153,000.

There is a similar story in Portland and Cleveland, where affordable housing groups have used TOP grants to develop Web-based system to improve coordination among providers of affordable housing. In both cases, the cities benefit from the presence of The Enterprise Foundation, a national foundation whose mission is to increase the supply of affordable housing. Coordinating with community non-profits and local governments, The Enterprise Foundation has helped convene relevant actors to submit TOP applications and plan how to best use the Internet to attack inefficiencies in the delivery of housing and—in the case of Portland's TOP grant—other social services.

One intangible but important ingredient in a local government's role in community technology initiatives is overall engagement with communications policy. Portland inserted itself into a national debate by filing a lawsuit to require AT&T to provide open access to its cable network when it comes to Internet access. That is, much as AT&T and other long distance carriers must,

at a nondiscriminatory rate, allow competing long distance companies connect to its network, AT&T and other providers of Internet services over cable networks would have to allow competing Internet service providers connect to their network. While this is not a local telecom or cable regulatory issue, it reflects how telecom and cable issues have a prominent place in local politics in Portland. Part of what drove Portland's suit was that local Internet service providers did not want to be unfairly (in their view) be shut out of the broadband market. This local engagement on a largely national issue is no doubt connected to local telecom policy activism.

In a different context, Austin contemplated a public role in the development of broadband network that would serve all segments of the community. These plans never came to fruition, but they demonstrate a city government and local populace that appreciate how communications infrastructure can affect a community. In fact, local policymakers saw the proposed broadband network as part of a larger city telecom policy framework that included encouraging Internet access for low-income individuals through initiatives such as the Free Net.

By comparison, local governments in Cleveland and Nashville pay less attention to local telecom issues. Last year, Nashville received a *D+* from *Governing Magazine* in a rating in information technology services for the Metro Nashville Davidson government. The poor grade was attributed to a patchwork computer system, in which old and rarely compatible computer systems were bound together with string and wire. Since the *Governing* article, Nashville's mayor has aggressively moved to improve the Metro government's information technology capabilities. This is a positive move, but given scarce time and talent among local officials, having to upgrade information infrastructure for local government—something Austin, for example, did in 1995—leaves little time for other Internet access policy initiatives for Nashville. Even with Cleveland's success in securing $3 million in cable access fees for computer boot camps, the city government seems relatively unengaged in use of information technology. As of late 2000, there was still no common domain name for city government email addresses.

Many of the initiatives profiled above are more closely linked to community development than economic development. But by trying to make all segments of the community part of the Internet revolution, Internet access programs for communities may improve a city's overall quality of life. In the case of Austin, community Internet access programs such as the workforce training grant from the Community Technology Initiative, has an explicit economic development goal. In general, however, there is little evidence in the five cities that community and economic development programs are coordinated.

6. Conclusions

There are two countervailing forces at work when thinking about the Internet's economic impacts on cities. The first is the decentralizing potential of the Internet and other advanced information technologies. By improving the quality of communications and lowering the cost, business operations can be more easily coordinated over distance, making the face-to-face interaction that cities facilitate less relevant. The second and countervailing force is innovation. The Internet presents opportunities for innovation in a number of ways, from business and government organizations to new products and services. And innovation is typically a

collaborative activity, and this kind of collaboration still relies on face-to-face contact. This makes cities quite relevant to the new economy.

Path dependence might be a sufficient argument in support of the notion that cities will matter in the new economy. Because cities today enjoy certain economic advantages, this will be sufficient momentum for them to maintain these advantages in the future. There is also a demand side component to the path dependence argument. Existing businesses located in cities are the early demanders of advanced communications services and network. Because they obtain them first, this positions them to hold onto existing businesses and people that depend on information services.

The case studies here suggest the path dependence will be further reinforced an emerging supply-side phenomenon. Cities, through many of the programs profiled here, such as Portland's creative services initiative, are attempting to increase the supply of ideas for multimedia products and services that will be exported beyond urban boundaries using the Internet. The success of these initiatives hinges on the effectiveness of social networks to stimulate innovation. If they are successful, the spatial implications seem clear—central cities will be significant beneficiaries of the New Economy. Moreover, the telehotel phenomenon suggests that the underlying infrastructure of the new economy will encourage clusters of economic activity, as physical proximity to large facilities with switches and routers remains important.

The social network approach to economic development outlined here, whether under the guise of entrepreneurs' networks or smart growth initiatives, demonstrates how cities are consciously trying to improve their attractiveness as places to do business. Many of these new coalitions are spearheaded by the private sector. Yet, as in the cases of Austin's digital downtown or Portland's creative services initiative, city policymakers play a key supporting role in providing environments for development of new social networks. Some cities will be more successful than others in capturing payoffs from the social network strategy. This does not means that cities will be irrelevant, but rather that some will be more relevant in an information economy than others. Urban patterns will likely be rearranged, but cities, as clusters of innovation, will remain as the primary centers of economic activity for some time.

References

Bell, D. (1973), *The Coming of the Post-Industrial Society*, Basic Books, New York.

Computer Industry Almanac (March 5, 2001), "U.S. Has 33% of Market Worldwide Year End 2000," http://www.c-i-a.com/200103iu.htm

Cortright, J. and Mayer, H. (January, 2001), *High Tech Specialization: A Comparison of High Technology Clusters*, Brookings Institution, Washington, DC: p. 4, http://www.brookings.edu/es/urban/cortright/abstract.htm

Greenstein, S.M., Lizardo, M.M., and Spiller, P.T. (1997), *The Evolution of Advanced Large Scale Information Infrastructure in the United States*, University of Illinois, Illinois.

Hepworth, M. (1990) *Geography of the Information Economy*, The Guildford Press, New York.

Horrigan, J.B. (Summer 2001), “The Internet, Cities, and Social Capital,” Pew Internet Project, http://www.pewinternet.org

Innis, H. (1950), *Empire and Communication,* University of Toronto Press, Toronto.

International Data Corporation, “Buyers on the Web to Increase Nearly Tenfold by 2002,” http://www.idc.com/Press/Archive/081798.htm

Machlup, F. (1962), *The Production and Distribution of Knowledge in the US*, Princeton University Press, Princeton, NJ.

Mandeville, T. (1983), “The Spatial Impacts of Informational Technology,” *Futures*, vol. 15, no. 1.

Moss, M.L. (1998), “Technology and Cities,” *Cityscape: A Journal of Policy Development and Research*, vol. 3, no. 3, p. 112.

Oregon Creative Services Alliance (June 1999), *Designing Portland’s Future: The Role of the Creative Services Industry*, ttp://www.portlanddev.org/creativeservices/report.html

Pew Internet and American Life Project (February 18, 2001), *More Online, Doing More*, http://www.pewinternet.org/reports/toc.asp?Report=30

Porat, M.U. (1977), *The Information Economy: Definition and Measurement*, Special Report 77-12(1), US. Department of Commerce, The Office of Telecommunications, Washington, DC.

Salomon, I. (1996), “Telecommunications, Cities, and Technological Opportunism,” *The Annals of Regional Science*, vol. 30.

Sassen, S. (1994), C*ities in a World Economy,* Pine Forge Press, Thousand Oaks, CA.

Scarborough Research (2001), http://www.scarborough.com

Schmandt, J., Williams, F., Wilson, R.H. and Strover, S., eds. (1990), *The New Urban Infrastructure: Cities and Telecommunications,* Praeger, New York.

U.S. Department of Commerce, 2000, *The Emerging Digital Economy.* U.S. Government Printing Office: Washington, DC.

Wilson, R.H. (1993), *States and the Economy: Policymaking and Decentralization,* Praeger, New York, chapter 2, pp. 29-30.