

**BACKGROUND MEMORANDUM II
BRIEFING BOOK - STRATEGIES FOR USING DIGITAL
TECHNOLOGIES FOR ECONOMIC DEVELOPMENT
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Hudson County Briefing Book

Strategies for Using Digital Technology for Economic Development

Urban development patterns have always been linked to technology. Advances in the methods of production, transportation, and communications have historically had profound effects on the physical forms and economic roles of urban areas. As the rate of innovation accelerates, technology will continue to act upon cities in new and unpredictable ways, presenting an evolving set of opportunities and challenges. This fast, flexible and ever-changing urban environment requires cities to seek new tools for understanding and managing their futures.

1.0 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION

The purpose of this briefing book is to provide an overview of the varying strategies possible for using digital technology for economic development. It is the result of a three-month survey by WRT, The Siembab Corporation and Anthony Townsend and should be used as the basis for future work on this feasibility study. It includes an overview of comparable cyberdistrict development efforts in eight U.S. cities and one foreign city and a discussion of the themes and strategies employed by those cities. The Briefing Book addresses three questions:

- What is the historical context of cyber strategy?
- What can we learn from attempts in other jurisdictions to use cyber strategies to reach local economic goals?
- How can Hudson County benefit from cyber strategy?

The information is organized into four chapters beginning with an introduction of cyber strategy and its historical context. The following section provides a summary of our cyber profiles of other cities including our key findings. The third chapter describes a number of potential cyber strategies that have yet to be tested due to the recent recognition of digital networks as an economic development tool. We conclude with some preliminary recommendations and a discussion of some key opportunities for Hudson County. The final chapter includes further information on the specific cyber profiles used in this survey.

Cyber = Digital Networks

Throughout this report *cyber* will be used synonymously with the term *digital networks*. Digital networks refer to the integration of computers with telecommunications. Therefore, cyber strategy is defined in terms of one or more significant aspects of digital networks – infrastructure, markets, or applications. Cyber policy is policy governing some aspect of digital networks. A cyber-district is a spatial area in which digital networks play a strategic role in its development and ultimate function.

1.2 HISTORICAL CONTEXT OF CYBER STRATEGY

Cyber strategy is a relatively new option for local governments. Land use, housing, public transportation, utility infrastructure, schools, libraries, and taxation are traditional sectors of strategic importance to economic development. The recent emergence of the globally integrated, broadband, digital network has added a new strategic sector. Part of its significance is that its deployment can also affect most of the traditional sectors.

In 1975, computers were large, expensive machines operated by a team of skilled technicians in air conditioned, security-protected rooms. Their development and deployment were unregulated although the federal government, as a large consumer, influenced the pace and direction of computer technology innovation. Telecommunications meant telephony which, until the landmark break-up of AT&T, was a privately owned public utility providing a relatively homogenous service integrated from end to end to end and regulated at the state and federal levels. In both computers and telecommunications, the role of local government was that of consumer and user.

Cable television was loaded with potential as a second wire to the home providing high bandwidth services. However, neither cities nor the cable industry found a way to make cable a strategic element of the metropolitan economy. The role of local government was franchiser focused on tactical concerns such as consumer service and basic service costs. While public, education, and government access policies sweetened franchise agreements, access failed to become strategically important.

The 1984 AT&T divestiture agreement was a key part of a government strategy to encourage competition in local exchange, intra-state toll, long distance, and customer premises equipment markets. In the post-divestiture era, new manufacturers were able to challenge Western Electric as the supplier of digital network equipment, and the newly independent regional operating companies jointly created BellCore to compete with the venerable Bell Labs for the research and development function.

The transition from a single, integrated, regulated utility uniformly serving over 93% of the population to a plethora of distinct competitive markets with widely varying penetration rates has been influenced by the phenomenon of technological convergence. Technological convergence refers to networks in and between computers becoming indistinguishable from computers in and between networks.

The federal government has consciously encouraged competition and technological convergence in order to obtain high rates of innovation in digital networks and gain the price efficiencies of market competition. Post-divestiture, the government has encouraged the formerly distinct markets of cable television, telephony, broadcast telephone, direct broadcast satellites, and terrestrial microwave to invest in digital technology and compete in each others markets. Since the early 1990s, the federal government has aggressively encouraged commercial development of the public airwaves which has resulted in a bonanza of digital wireless services and products.

The federal government also fostered the commercialization of its ARPANET into today's Internet. This is perhaps the most powerful transfer of technology in history — from purely government applications into worldwide commercial use. A Commerce Department report released on February 5, 2002, found that 54%

of all US citizens were using the Internet in September, 2001. That is 26% more people than in September, 2000. The Department estimates that 2 million new users in the United States are going online each month.

Competition inspired by technological innovation set new market dynamics in motion. Coherent public sector cyber strategy, policy and initiatives at the local and regional levels which are only now beginning to emerge, are a response to new challenges and opportunities, such as the following:

- The substantial investment required to provide facilities-based competition in the “final mile” has limited competition in the local exchange market to the most dense or commercially successful cities or districts within cities. Without one or more competitive local exchange carriers (CLECs), public officials frequently worry that the incumbent local exchange carrier (ILEC) will not be pressed to make the appropriate investments to modernize the distribution and switching plant.
- Inter-industry competition and open markets created opportunities for public sector organizations such as rail transportation authorities, utility districts, and municipal corporations to join with private sector partners to build network facilities in order to lower costs, or to introduce competition where private competition has failed to materialize.
- The local exchange carrier’s responsibility for distribution plant ends at each building’s network interface plate. Each building owner, whether the building is a factory, office, or residence, became a mini-phone company by virtue of owning the internal wiring and being responsible for its maintenance. Internal wiring joins systems for elevator, electricity, and air conditioning as a potential source of building decline.
- Web page design, key word selection, and registration with search engines have all become important factors for the modern business to manage. This applies to existing businesses selling traditional products – but now selling to an international audience. It also applies to entirely new products that would not have existed without the Web. “[These examples] don’t represent new ways of selling the same old things but new ways of creating new markets for products or services that would not have existed in the ‘old economy’.” (Esther Dyson, “On Web, Imagination Knows No Bounds.” Los Angeles Times, September 11, 2000)
- Average annual improvements in price-performance ratios for digital network technologies are unprecedented. Capabilities increase while prices decrease. This makes digital network technologies essential to business success as the competitive market rewards those firms that can reduce the costs of production and distribution. Land, labor and capital do not share the price performance profile of cyber technology. Therefore, all substitutions of cyber technology for land, labor and capital provide substantial rewards.
- The customer premises equipment market has become more competitive and innovative. In 1980, a handset in a New England village store was virtually the same as the one on a Hollywood producer’s desk. It was designed by Bell Labs and manufactured by Western Electric. Product innovations were limited to shape and color. Today, most household consumers, governments, non-profit community organizations, and businesses small to large, struggle to understand their options. Identifying their needs, linking those needs to a line of products and making a cost-effective purchase decision is beyond the capabilities of many organizations.

- In the post-Divestiture market place, devices at the customer's premises have required an entirely separate capital investment by each consumer. Formerly, the consumer leased the equipment with the costs included in the price of basic telephone service. As noted, virtually every consumer had similar equipment. Competition has resulted in vast differences within a single community in network utilization capabilities. The various disparities in the ability to access and use digital networks has been labeled the *digital divide*. These disparities occur in terms of race, age, education, income, and residential location.
- The access disparity worsens at the level of network utilization practice. Each device requires an organized enterprise-purpose and a certain amount of technical knowledge by the staff for it to be routinely used. Many high-end technologies sit under-utilized because the usage has not been built into normal business practices, or few people know how to master the software's user interface. Video conferencing is a good example.

Creative and powerful strategies to address the challenges and capitalize on the opportunities are only now beginning to emerge. The next section provides the results of a survey of cyber strategies.

2.0 CYBER STRATEGY PROFILE SUMMARIES

As Hudson County begins to develop a cyber strategy, it is useful to study initiatives being planned or implemented by communities elsewhere in the nation and the world. The nine profiles of cyber strategy included in Chapter 4 are logically grouped in four categories:

1. Cyber Industry Clusters
2. Cyber Infrastructure and Markets
3. Cyber Access and Applications
4. Cyber Vapor

The strategies profiled sometimes have elements of more than one category. The following describes the categories, identifies the strategies, and provides the key observations from each profile.

2.1 CYBER INDUSTRY CLUSTERS

This approach focuses on the aggressive recruitment of ‘cyber-tech’ companies to provide a high-wage, high value-added, recession proof basis for local and regional economies. Technically, this is not a cyber strategy because it need not involve any aspect of digital networks, other than perhaps the firms which design or manufacture components for them.

Typically, new developments are marketed to target industrial clusters as destination enclaves; physical concentrations in places like office parks or former industrial zones. One difficulty with this approach is that there are no models for how to grow an industrial cluster from scratch. Industrial clusters involve a web of businesses in complex supply and distribution chains. Even if it were possible to direct the development of this web of economic activity, it would take many years to accomplish. The following are examples.

- TelecomCity; inner suburban ring around Boston, Massachusetts
- Digital Media City; metropolitan Seoul, South Korea
- Plug ‘n’ Go/Digital New York City; New York City
- Communications Technology Cluster; Oakland, California

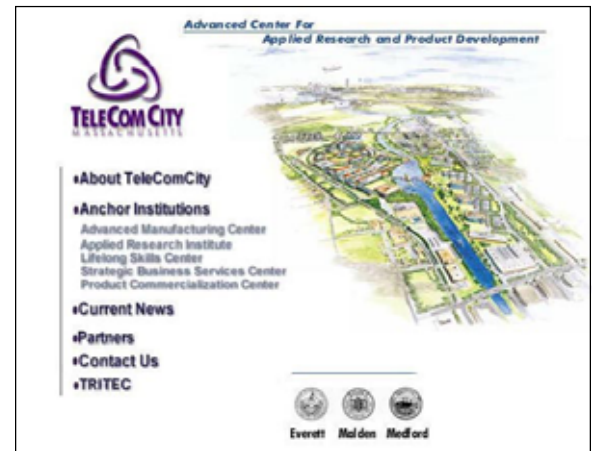
A summary of each strategy and key observations follow:

2.1.1 TelecomCity

This was a vision for a standard commercial office development on 200 acres of brownfields at the intersection of three inner ring suburbs of Boston. It gets its name from zoning restrictions that limited occupancy to the telecommunications industry. Despite winning an EPA award for brownfield development, the ailing telecommunications industry is no longer an attractive tenant, the political coalition built on the three adjacent suburbs has disintegrated, and the project as planned will probably never be built.

Observations:

- Cyber technology is often perceived as a touchstone. A vision that incorporates a reference to cyber technology can be strong enough to galvanize political support for what is actually a standard commercial development. However, when the vision does not include comprehensive quality of life concerns and does not incorporate local support, even a cyber vision will not hold the political coalition together.
- Basing the vision narrowly on the prospect of attracting a particular industry or segment risks the prospect of industry decline or disinterest by the target businesses.
- Land developments, regardless of the cyber vision, that require the support of a political coalition of cities, developers, and state agencies for greater than a four year period are vulnerable to the electoral politics of the government partners.



2.1.2 Digital Media City

The Digital Media City (DMC) has been planned as a new town development in the inner suburbs of Seoul on one of the last large tracts of vacant land in the area. A fiber network will be part of the infrastructure, however there is no competitive advantage in that Seoul is one of the most wired cities in the world. The DMC is intended for Korea's emerging new media industry which would be given a place to nest and develop into a dynamic, entrepreneurial cluster. The City also hopes to attract information technology firms in general. The land has been prepared and the City is currently searching for a master developer with the land apparently dropping in value from what was expected. A central conflict is that innovative media and entertainment firms in animation and film have quite different urban setting and cultural demands from information technology firms. Also, there has been no provision for seeding and growing firms.

Observations:

- Social capital must be created and nurtured through a broad variety of institutions and networks which are difficult to plan and implement from the ground-up.
- Effective marketing of a development requires a clear vision of what will emerge.
- The strategy is in early stages of development. It will require monitoring in order to draw more substantive lessons.



2.1.3 Plug ‘n’ Go/Digital New York, New York City



This example involves elements of attracting and nurturing a cyber industry cluster – new media, which became known as Silicon Alley — as well as network infrastructure. The success of Silicon Alley was based on local entrepreneurs, public venture financing and the Plug ‘n’ Go program. Plug ‘n’ Go basically provided cheap (subsidized), wired office space for startups. It was so successful that by 1999 all 14 buildings that ultimately participated in the program were fully leased. The Digital New York program attempted to replicate the success of Plug ‘n’ Go in the suburbs in part as a decentralization strategy. The new media industry was in decline and less than 20% of the available space was leased.

Observations:

- A cyber industry cluster has its own dynamics that the local government can reinforce but which are hard to create from whole cloth.
- A successful attraction and retention strategy needs to be broad and rely upon a multitude of linked incentives and subsidies that can include a cyber infrastructure component.
- Timing is important – a thorough understanding of the target industries is critical and should rely upon advisors with direct experience in business.
- Cyber infrastructure cannot overcome other market conditions.

2.1.4 Communications Technology Center, Oakland, California

In 1996, Oakland opened the Communications Technology Cluster (CTC), located in the historic landmark Rotunda Building in downtown Oakland. CTC is a public-private partnership between Sustainable Systems, Inc., the Oakland Business Development Corporation, and the City of Oakland. It provides shared business services, training, and technical support at attractive rents for high growth potential companies in various technology sectors. Since 1999, CTC graduate companies have gone on to raise \$220 million in external funding.

Observations:

- Small business incubators are a practical, cost-effective way to begin harnessing local entrepreneurial activity
- Even a successful incubator will not help overcome deficiencies in poor human capital assets citywide.

2.2 CYBER INFRASTRUCTURE AND MARKETS

Concern for the adequacy of the network infrastructure and affordability of the local market for network services (as these conditions affect business attraction and retention) is the stimulus for many cyber strategies. A recent RFP for a Telecommunications Master Plan issued by the City of Corona, California captures these concerns:

“The overall goal . . . is to assess the success of the private sector in meeting telecommunications needs of the community and to determine what can or should be done to maximize telecommunication opportunities for residents and businesses. [The City wants to] ensure innovative telecommunication services are available to businesses to attract and retain top companies.” City of Corona, November, 2001.

Local governments have responded to these concerns in a variety of ways from providing incentives to private network developers to the direct provision of additional infrastructure. Three examples are discussed.

- CivicNet; Chicago, Illinois
- GTE Smart Parks; various U.S. cities
- Metropolitan Area Network; Pasadena, California

2.2.1 CivicNet; Chicago, Illinois

This initiative leverages the aggregated purchasing power of the City, school district and other public agencies to get a coalition of private firms to build a high capacity digital backbone network to serve every neighborhood in Chicago. The City expects the network to stimulate economic activity in the neighborhoods and commercial districts outside of the downtown.



Observations:

- A strategy supported by a coalition of interests has a better chance of advancing than if it is promoted by a single jurisdiction. In this case, the dominant metropolitan government asserted its leadership in order to form the coalition.
- The strategy grew out of a marketplace opportunity to aggregate buying power in order to create the equivalent of an extensive public-private metropolitan area network (MAN). Since economic development requires access technologies, skill sets, business practices, and motivation to innovate as well as adequate bandwidth in the infrastructure, it is not clear whether a purely infrastructure strategy will succeed in its ambitious goals of reinvigorating neighborhood economies and countering the “digital divide”
- The strategy is in early stages of development. It will require monitoring in order to draw more substantive lessons.

2.2.2 GTE Smart Parks and Smart Centers

In the mid-1980's, the formerly independent GTE (since merged into a new company, Verizon) developed a program for using building and campus telecommunications infrastructure to enhance the value of real estate. The program was known by the trademarked names *Smart Parks* (applied to low density business parks) and *Smart Centers* (applied to high rise office buildings).

Although the program was based on an agreement between GTE and a developer, the result was generally embraced by the local jurisdiction as a strategy for developing and marketing commercial and industrial property. The program was actively offered to developers for fifteen years. It was terminated in August, 2001 by Verizon management.

Observations:

- Modest benefits, in this case improved absorption rates, were realized through modest industrial and commercial developments enhanced by technology.
- Management support in a private sector initiative is equivalent to political support in a public sector led initiative. When management – or elected officials– change, initiatives are vulnerable to cancellation.

2.2.3 Metropolitan Area Network, Pasadena California

The public electric utility needed to upgrade its copper wire infrastructure in 1997. It built a 25 mile fiber backbone network at a cost of \$2 million and retained a private sector partner to market the excess capacity to businesses throughout the city as an economic development strategy. The private partner went out of business and no services have yet been marketed 3 years after network construction was completed.

Observations:

- Fiber MANs can be cost-effectively developed when based on a local jurisdiction's need to upgrade its copper network infrastructure.
- The private entity in the public-private arrangement proved to be unable to sustain its participation, handicapping progress toward the economic goals.
- Three years after the MAN became operational, virtually no progress has been made toward the economic goals. As mentioned in relation to Chicago's CivicNet, access technologies, skill sets, business practices, and motivation to innovate are required in addition to adequate bandwidth for capturing economic benefits. The Pasadena example reinforces the caution that purely bandwidth strategies may not be sufficient for achieving economic development goals.

2.3 CYBER ACCESS AND APPLICATIONS

One of the barriers to effective use of the digital, broadband network is *access*. Access refers to the ability to buy and use the devices that attach to the network. This can include simple telephone handsets, complicated remote sensing devices for telemedicine diagnostics, expensive video conference units, electronic white boards for meetings, fax machines, and so forth. The need for these devices is not usually apparent because they are owned and used privately. Yet it is only the most affluent corporations that are appropriately equipped for network use.

Access technologies lead directly to *applications*. In some cases, the access technology determines the application – a device for remote fetal monitoring for example has only that dedicated use. In all cases, applications require access devices.

Applications are the final linkage between digital networks and economic benefits. E-commerce transactions are manifestations of actual economic activities. Distance education can cost-effectively deliver educational products, often any-time, any-where. The benefits include travel savings, economies of scale in audience size, and consumer convenience. By focussing cyber strategy on applications and access, economic benefits can be easily verified. There is one example of this category of cyber strategy.

2.3.1 Blue Line TeleVillage, Compton, California

This is a non-commercial, shared-use, multi-function communications center developed in a low income, mixed-race suburb of Los Angeles. The facility was funded by the Los Angeles County Metropolitan Transportation Authority as a joint economic development-mobility strategy. The facility included a telework center, computer center, videoconference center, kiosks, and a large meeting room. It provided low cost access to a range of services, information and transactions. They included distance education classes, library story telling for children, computer classes, internet access, business mentoring, voice mail, telework stations, public access computers, bank ATM service, and more. The project produced measurable economic and transportation benefits. The facility remains in operation under the direction of the City of Compton.

Observations:

- Strategies that integrate land use, transportation, network access, network applications, and network services can lead to specific economic and mobility benefits.
- This single facility demonstration project would have been more effective if additional facilities at different locations had been added. In other words, a system of such facilities is needed.
- Network access centers can be successfully designed to reflect the needs and interests of the surrounding community through a community-based planning process.

2.4 CYBER VAPOR

In this era of lightning fast innovation, venture capital, and geographically mobile corporate structures, effective marketing often attracts a great deal of attention and investment. Creating a marketable and identifiable ‘buzz’ can largely be attributed to good information dissemination which we call cyber vapor. Many cyber strategies have focused on the provision of difficult to find information helping companies to identify available properties, locate infrastructure and wired buildings, and navigate the often complicated layers of subsidy and tax structures. In other cases, a potential cyber strategy is used as a marketing ploy and never carried through to a definable action plan. One example is discussed.

2.4.1 Digital Harbor; Baltimore, Maryland

Like Oakland and Hudson County, Baltimore, Maryland suffered a long period of decline in the second half of the 20th century as inner-city factories, shipyards, and railroads left for the suburbs and other parts of the country. However, Baltimore is trying to develop its capacity to create wealth in the information economy through a comprehensive strategy dubbed the “Digital Harbor”.



The Digital Harbor project seeks to create 55,000 jobs over the next decade. The Baltimore Development Corporation has asked the state of Maryland for \$300 million in infrastructure improvements over a five-year period, which it believes can be used to leverage \$4 billion in private investment. “The Digital Harbor” is a name chosen to market the entire region - Baltimore’s Inner Harbor is at the epicenter of an expanding cluster of technology-driven companies and universities that form a regional “technology watershed.”

Observations:

- Effective marketing and public relations can create lots of value even without real action.

2.5 CONCLUSIONS ABOUT THE FOUR CYBER STRATEGY CATEGORIES

The opportunity to adopt a local cyber strategy for economic development is less than 20 years old. As with most innovations, it takes a while for utilization and policy to catch up with the potential.

Most city, county and regional governments have *not* ventured into cyber strategy. Many of those who have, have done so by forcing cyber technology into some variant of a familiar *industrial attraction model*.

One version of this is to attract specific cyber industries to locate in the jurisdiction — for example, telecommunications hardware companies or digital media software firms. In the examples profiled, a new development was dedicated to a target industry or company as an attraction inducement and as a way of marketing the development. While there are surely successful examples of this strategy, it is one that is fraught with risk.

For example, Orange County, California is home to numerous office centers and modern industrial parks. It has a modern network infrastructure and wide streets. It is wealthy, has educated workers, and a powerful university, University of California, Irvine. It was, in the 1980s and 90s, considered to be the best hope to create a preeminent technology cluster in Southern California.

However, even with the technology-driven economy of the 1990s, no Orange County technopole emerged. According to a July 9, 2000 article in the Los Angeles Times (“Dreams of High Tech Glory Passing Orange County By”), “Orange County made an ill-fated bet on computer hardware products and was slow to see the Internet revolution coming. In addition, its new developments were too suburban, lacking the trendy nightspots and meeting places that were instrumental to the success of the Santa Clara Valley south of San Francisco.”

Technology clusters are complex economic phenomena that are difficult to rationally plan. They seem to “happen” in the right conditions that defy replication at other places and times. Digital networks can be used effectively as part of a larger package of public incentives. But building wiring by itself, for example, cannot cause the growth of an industrial cluster.

The Cyber Infrastructure and Market Strategy is also based on the industrial attraction model. In this case, technology is used to enhance the attractiveness of a place to industries with particular characteristics. For example, in the 1950s, some cities developed municipal electricity generation capacity in order to sell below-market rate power as a strategy to attract the aluminum and other electricity intensive industries. Others installed brine sewers to attract the chemical processing industry. And so forth.

The new Millennium version of this phenomenon is centered on the local availability of bandwidth. In the words of Chicago’s Mayor Daley, “It’s not unlike the spread of railroads in the nineteenth century. If the transcontinental tracks came through your town, prosperity followed. If it didn’t, you were out of luck.” No leader wants their city to be “out of luck” in regards to broadband digital networks.

One response has been to create some form of public-private partnership to build a metropolitan area network (MAN). These decisions are usually justified by some combination of three objectives:

- Raise revenue by leasing rights-of-way, vault space, or conduits to a private partner.
- Upgrade existing government owned copper distribution plant to fiber optics with a private partner who commercially markets the excess capacity.
- Stimulate economic development by ensuring available bandwidth at a discounted price.

Generally, success in reaching the economic development objective is difficult to verify without significant research activities. In the examples profiled, Chicago has embarked on a novel path to funding the MAN, but economic development outcomes are many years away and may prove unverifiable. Pasadena encountered problems with its private partner. There have been no economic benefits over the three years since the MAN became operational.

The anecdotal evidence from the technology enhanced real estate Smart Park program run by GTE suggests that the linkage between building/campus infrastructure and economic outcomes was limited to more rapid absorption. There were apparently no price increments.

While bandwidth availability and pricing get a lot of attention, and no city wants to be left “off the tracks,” these strategies are neither closely linked to economic development nor have their economic benefits been well documented.

Cyber Vapor draws on the “touchstone” qualities of cyber technology mentioned above. In the 1980s, the City of Antonio received significant press coverage for a “teleport” that was never built. The computer industry has a long history of announcing products that are not close to being ready for market. Southern California’s Tech Coast is a label invented to suggest a place filled with technology industries as a way of competing with the image of Silicon Valley. The Digital Harbor is another example of image competition that is also a version of the industrial attraction model.

Aggressive marketing of substantive strategies will be more successful than marketing vapor.

The Access and Applications category has few practical examples but holds the greatest promise for effective cyber strategy. It has few examples because it is forward looking and not related to the traditional industrial attraction model.

Providing non-commercial shared use access to the many technologies needed to make effective use of broadband networks addresses a neglected market segment. The market segment formerly known as customer premises equipment was not only deregulated along with bandwidth, but its options have exploded. There are video conferencing options from the desk top to large meeting halls. Digital cameras, bar code and point of sale devices, scanners, digital telephones, and audio bridges are just a few of the new devices that can be attached to the digital network. Use of these devices is much more closely related to economic outcomes than is bandwidth.

The reason is that access leads directly to applications and it is applications that yield economic benefits. Distance education, telemedicine, e-government, e-commerce, e-business, distance training are families of applications that produce payoffs.

Digital networks have a more complex relationship to economic development than do other resources. As with other resources such as electricity, availability and price are issues. However, it is the interaction between cyber technology and virtually every other system and sector that produces the most significant benefits. In sum, three main components are critical as part of any Cyber Strategy:

- providing a physical environment for cyberdevelopment,
- cultivating a favorable economic climate, and
- strategies for promoting and sustaining the cyberdistrict.

The most successful strategies include a diverse menu of initiatives ranging from infrastructure deployment, applications and uses, marketing, supportive government policy and involvement and partnerships with local community organizations and universities. Flexibility must be recognized in the approach as the rate of technological change is unprecedented. Finally, complementary strategies need to be incorporated that include urban design and planning components such as housing, parks and open space, and other amenities that make environments attractive for new and existing businesses.

In other words, integrating digital network use with other systems is the basis for a forward looking cyber strategy.

Specifically in Hudson County, the systems with great benefit potential for digital integration include:

- Government – county and municipal
- Primary and secondary education
- Post-secondary education
- Workforce preparation
- Small business assistance
- Libraries
- Transportation

The next section introduces technological developments that could be incorporated into a cyber strategy in Hudson County. They are presented in order to expand thinking about the possible dimensions of the Hudson County Cyber Strategy.

3.0 BUILDING BLOCKS FOR FUTURE CYBER STRATEGIES

The examples in Section 2 give an overview of the varying scale and scope of existing cyber strategies. However, with cyber strategy in its infancy, there is tremendous opportunity to become a leading edge jurisdiction by pushing beyond known territory and exploring new approaches. There are few known, proven positions to take on cyber strategy that provide any guarantee of results. Hudson County's remarkable geographic position and economic assets may provide the context in which to realize a holistic, pace-setting cyber strategy, one that helps achieve the economic development goals of the County. Building blocks for future cyber strategies are detailed below.

3.1 NEW AND OLD INDUSTRIES

The lower costs of production and distribution possible through cyber technologies dramatically reduces the capital barriers to market entry. As a result, new industries are developing and growing, and firms in established industries are vulnerable to new firms who have adopted the new technologies and practices. Music production is an example.

Software and computers have transformed the way in which music is recorded. They have slashed the cost of studios, put broadcast-quality sound within the amateur's reach and opened new creative avenues. Hard drives substitute for magnetic tape, plug-in cards and computer mice take the place of mixing consoles, and software emulates compressors, limiters, and reverbs.

This is a world in which a single individual with technical expertise and a musical gift can produce a fully orchestrated composition on equipment that costs a few thousand dollars, burn CDs for less than \$.50 each, or distribute the product to a global market over the Internet at virtually no cost.

A similar dynamic is working in most industries. Below are two other examples:

Photographic Processing Industry

This industry includes the following kinds of businesses; photofinishers, custom and professional labs, service bureaus, in-plant industrial labs, and digital imaging centers. Rapid changes in technology and equipment are transforming the workflow so that it includes digital processing along with the traditional. There are new and evolving digital output options. There is the potential for new competition from neighborhood "minilabs" and kiosks. The kiosk market consists of dispensing digital cameras, outputting digital prints, and promoting "media cards" as the next digital "film." Is the photo processing industry in Hudson County coping with these technological changes? Are there entrepreneurs in Hudson County who could, with the proper support, compete in this industry regionally?

Motion Pictures

The following is a quote from the Web page of the Los Angeles Regional Technology Alliance. (www.larta.com)

“Historically, the real power in the entertainment industry has always resided where most of the capital strength is centered – the major film studios, tv networks, and ‘big’ recording labels. However, over the last few years, the development of new digital technologies has given way to the possibility in a shift in the control of power in Hollywood. The creative and production processes have already been influenced deeply by digital technology. Distribution is next. While the paradigm shifts, new concerns arise.”

What initiatives would help Hudson County businesses modernize with digital technologies in order to become more competitive? What initiatives would allow Hudson County entrepreneurs to enter and successfully compete in established markets?

3.2 UTILITY COMPUTING

Over the last 30 years, computing models have evolved from mainframe to client-server. Hewlett-Packard’s Internet Systems Storage Lab predicts that a utility computing model will displace the others within the next 5 to 7 years.

Utility computing is a model in which scalable, cost-effective, network technology capabilities will be provisioned, delivered, metered, managed and purchased as a service, much like electricity today. Consumers of these services will be large enterprises that are trying to deploy services that either increase the productivity of their employees, dramatically reduce their operational costs, or support rapid creation of competitive differentiations of their products, businesses and services.

Processors, storage and communications can be produced in a central pool and accessed as needed. This would eliminate the need for large firms to maintain processing and storage systems dedicated to their business processes. Organizations with seasonal peak demand such as Amazon.com and the IRS have systems that are over-provisioned during most of the year and under-provisioned during the peak season.

Utility computing promises between a two- to ten-fold price performance improvement in delivering services. A substantial source of savings comes from the \$3 to \$4 of operating costs currently required for every \$1 dollar of investment in hardware and software. Firms that lag in the transition from the client-server model are likely to be at a competitive disadvantage in their respective markets. Should Hudson County begin negotiations with likely vendors of Utility Computing to test the service or introduce it locally before it is available elsewhere?

3.3 ULTRAWIDEBAND WIRELESS NETWORKS

Intel Corporation expects that its new technology for using wireless Ultrawideband (UWB) networks will be commercially available in the same time frame as Utility Computing, within 5 to 7 years. UWB promises

high-speed wireless broadband data speeds much faster than either current wired or wireless networks, with speeds up to 400 to 500 Mbps. The FCC approved the wireless technology in early February, 2002. What are the strategic applications from using the combination of wireless broadband and Utility Computing together that could benefit the county?

3.4 KIOSKS

One of the critical competitive characteristics of a work force is its level of technological literacy. One approach to creating a baseline of universal techno-literacy is for the dominant institutions and businesses to introduce a cyber channel for customer service. One approach to creating a cyber channel is through different kiosks that could be placed in a variety of public and private spaces throughout the county. The following are some of the kiosk/ATM options that have been announced in the last two years.

- ATMs that allow consumers to transfer money to someone else. Western Union Financial Services Corp. announced a plan to offer money transfer via a network of ATMs owned by American Express in April, 2001.
- Many of the installed base of ATMs are used to sell postage stamps and prepaid phone cards. In the future, ATM customers will also be able to get news headlines, stock quotes and conduct limited e-commerce transactions such as buying concert tickets or applying for a credit card. Wells Fargo Bank announced in May, 2000 plans to hook up thousands of its ATMs to the Internet, becoming the first U.S. bank to attempt to transform its ATMs from simple cash dispensers into full-fledged financial kiosks.
- Loyalty programs, non-cash self-service terminals and Web payphones are some of the interactive kiosk applications that can, in addition to fostering more technological literacy among consumers, fulfill a business case specifically for the retail, financial, tourism, government, entertainment and telecommunications industries. These kiosks would allow businesses in those market to become more competitive by reducing expenses while improving customer service.
- Easy Wireless launched in 2000 an e-tailing kiosk that serves as a virtual warehouse, learning center, and interactive media center providing continual advertising opportunities. It provides consumers a choice of 3,000 wireless accessories using a touch screen monitor.
- Bank of America began, in 2000, to install talking automated teller machines to serve blind customers in its largest markets.
- In 2000, HUD developed "Next Door" kiosks which display information about buying homes with the help of FHA insurance, locating affordable rental housing, finding homeless shelters, learning about HUD programs in the community, getting job training, and economic development assistance.
- Visionics announced in 1999 a new generation of ATMs that use biometric technology to verify the identity of the consumer. One planned application is for cashing checks by individuals who do not have a regular bank account.

- Body scanning kiosks – measures and sizes individuals so that they can buy clothes online that fit well. Replaces the measuring tape and fitting room. They were being considered for deployment by Lands End and Brooks Brothers in October, 2000.

3.5 VIRTUAL ORGANIZATIONS

Virtual organizations are *agile* – they have no central office, minimal overhead and are able to hibernate in bad times. Agile companies establish market niches that aren't likely to be lost during recessions. They undercut competitor's bids while maintaining a high profit margin.

Contact between co-workers is maintained via synchronous telephone calls, voice mail and e-mail. Co-workers might meet with one another or even the client at the beginning of each new project and not again until the project is completed.

Gartner, Inc. published a “Strategy and Tactics/Trends and Direction” memo on January 3, 2002 that addressed many of the issues involved in the transition to the “e-workplace.” The memo was entitled “Creating Resiliency with the E-Workplace” utilizing the theme that collaboration applications and knowledge management systems provide the technology basis for resiliency in the virtual organization. The memo begins with the following:

“In the aftermath of the attacks on the World Trade Center and the Pentagon, the benefits of distributing operations were readily apparent. The trend toward greater distribution of operations has been evident for almost two centuries and has been accelerated by almost every new emerging information technology since the telegraph. However, until recently, the technology was used to communicate between distributed facilities or to collect and centrally analyze data. It was not until the emergence of PC technology that the physical disaggregation of the workplace itself became possible, first through the exchange of data disks, then through LANs and WANs, and finally through IP virtual private network (VPN) technology. Now, new smart, wireless personal devices, are extending the disaggregation of the workplace to anywhere that a knowledge worker may be.”

Virtual organizations can create demand for other virtual organizations. According to Gartner, the biggest challenge to the resiliency of the virtual organization is the dispersion of talent, which makes it harder to develop personnel and their competencies. Although there is no substitute for good career management, mentorship, and classroom training, distance education can decrease the amount of face-to-face professional development that is needed.

How would a commitment to seed and support virtual organizations throughout the county serve the long term goals of the county? Can significant reductions in traffic congestion also be achieved?

3.6 INTEGRATED STRATEGY – THE MILLENNIUM COUNTY

In 2001, WRT and the Siembab Corporation collaborated on an integrated, holistic strategy for the county of the future – the *Millennium County*. The design competition was held by the Orange County Council of Governments in cooperation with UC Irvine, Orange County Transportation Authority, the American Planning Association, American Institute of Architects and others. The strategy was awarded first prize.

The Millennium County represents a new paradigm for spatial economic organization at the county scale, based on the capabilities of digital networks. Network Stations like the facility demonstrated at the Blue Line TeleVillage would be used to retrofit the county so that it functions through a set of village and neighborhood centers.

In general, Network Stations will provide every community with universal access to the tools for participating in e-commerce. Specifically, this will provide:

- access points to electronic commerce and training in computer skills,
- an adjacent material-economy marketplace where goods will be sold to those visiting the Network Station,
- a public facility with “spread effects” for the adjacent real estate,
- a platform for a variety of economic development programs such as small business start-up seminars and computer skills training,
- a way to capitalize community-based non-profit corporations that provide low income communities with housing, health care and job training, and
- a place for diffusion of technological and programmatic innovations that will stimulate the private market for information technologies.

An array of low impact private vehicles and new forms of public transit would provide local, physical mobility. Digital networks would be used to import the functions needed by each community into the village and neighborhood centers.

The Millennium County strategy can be quickly and affordably implemented since relatively little new bricks and mortar construction would be required.

How would the Millennium County Strategy transform the economic future of Hudson County?



The Millenium City - Orange County Strategy



District approach integrating network access centers and associated applications and physical recommendations



Conceptual view of a network access center providing new functions to an existing, deteriorated shopping center

3.7 RECOMMENDATIONS FOR HUDSON COUNTY

For cities prepared to take appropriate measures, Cyber Strategy can lead to economic growth and an improved quality of life. Our analysis suggests that the Hudson County's Cyber Strategy should focus on:

1. Ensuring all established businesses, non-profits, government agencies and entrepreneurs have affordable access to- and the ability to use the full range of devices that attach to the digital broadband network.
And
2. Ensuring that these technologies are deployed at some optimal level in the public realm to ensure all members of the public increase their technological literacy through normal social processes. And that access to network technology intersect with the various public transit services in Hudson County, including the Hudson-Bergen Light Rail System, PATH, and New Jersey Transit commuter rail and bus lines.
3. Forging the network applications that lead to economic outcomes – by integrating cyber technology into the service delivery systems for education, transportation, government, work force training, small business development, and tourism.
4. Modernizing the business practices of government agencies, business organizations, and non-profit corporations in the County so that network usage increases substantially over current levels, and that local private enterprise becomes more competitive in the process.
5. Looking forward toward emerging technological opportunities so that the adopted strategy and initiatives are “future proofed” and adaptive.
6. Integrating with and reinforcing other key elements of an urban modernization process, including housing, urban design and the other factors that make distinctive places.
7. Sustaining the various initiatives for at least five years so that the economic culture has time to change and adjust to new technologies and new business practices. Ultimately, the economic culture should incorporate constant adaptive change.

To fully realize its cyber-potential Hudson County must seek to fully understand its global and regional position as well as the opportunities at a local scale. Later phases of this work will include a more specific discussion on the relative strengths and weaknesses of Hudson County that will provide the basis for the cyber strategy vision and proposals. However, it seems prudent to note a few key opportunities early on in this process for discussion and further thought.

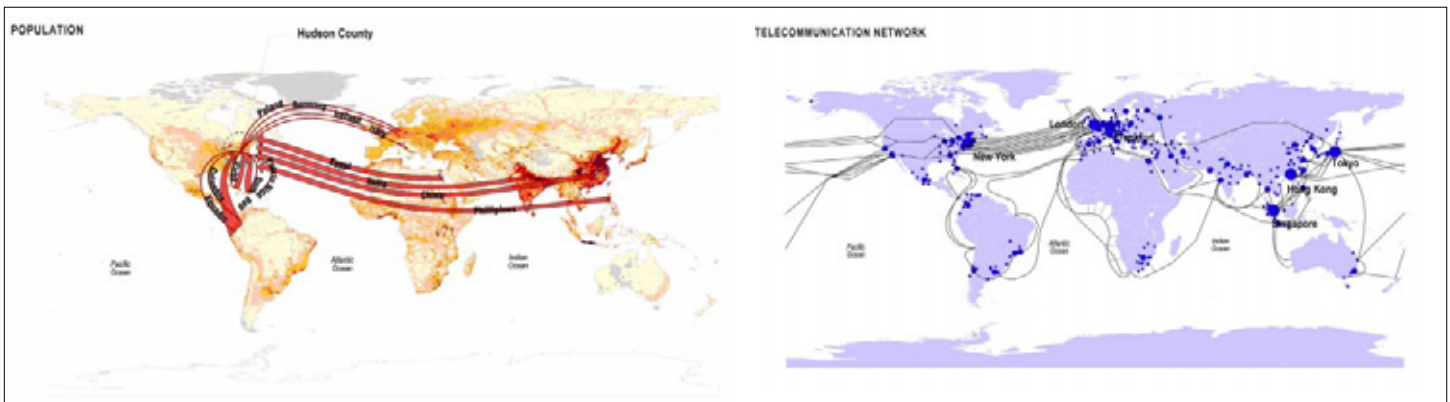
In conclusion, the opportunities for Hudson County occur at three broad scales – global, regional, and local.

Participating in a global community

Globalization and telecommunications technologies have developed hand-in-hand, stretching back hundreds of years. It is no surprise then that the cities where firms and individuals quickly adopted new communications technologies are the same cities that flourished through trade and cultural exchange.

Cities in the information age are taking advantage of today's innovations in communications technology at different rates as well. However, a number of trends favor communities like Hudson County as it attempts to compete for information age prosperity:

- *Immigrants provide strong linkages to the global marketplace.* Past waves of immigration to Hudson County usually said goodbye to their birth countries upon leaving, never to return. Today, however, cheap international communications and air travel mean that immigrant communities maintain strong connections with their home countries. These human networks, supported by technology, can provide a bridge for local economic development.
- *Location still matters in the telecommunications age.* Key locations enjoyed strategic advantages in the industrial era because of access to rivers, rail lines, or Interstate highways. The development of telecommunications networks favors many of the same places because of their central location or proximity to the sea.¹ Hudson County's legacy as a transportation node has given it an important role in the new information infrastructure. As a 'logistics' city, it serves one of the largest markets in the world and is an important component in a global economy.
- *Global decisions effect local spaces.* With the reduced use of the Panama Canal, the local Ports are experiencing an increase in usage. These global demands are fueling the need to redevelop brownfields and create developable land that supports these activities. The NJIT and EPA study for the International Intermodal Corridor in association with the NJDOT's proposal for the Portway corridor is one early response to the need to respond to global changes and provide space locally to support these larger economic systems.



Building smarter, more livable districts

At the metropolitan level, new information and communications technologies offer many possibilities for improving urban management, land use patterns, and transportation. Much of both the theoretical and empirical research on telecommunications in urban planning has been concerned with metropolitan-wide strategies.

Hudson County has the opportunity to reinvent itself in terms of livable districts characterized by small town qualities, walking environments, innovative transportation technologies, and attractive places.

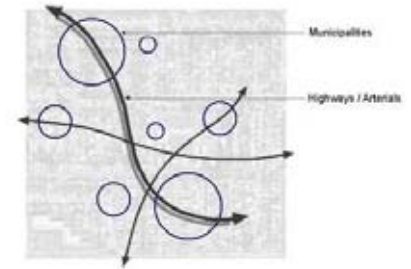
Hudson County is one critical component within the New York region. Global cities like New York cannot function without the mutually reinforcing uses and infrastructure that places like Hudson County possess. As many of the political boundaries that define planning efforts do not reflect the current flexibility of the economic environment, Hudson County has the unique opportunity to find a Cyber Strategy that not only reinforces existing initiatives but provides a connective voice for all of the County's municipalities.

Revitalizing neighborhoods

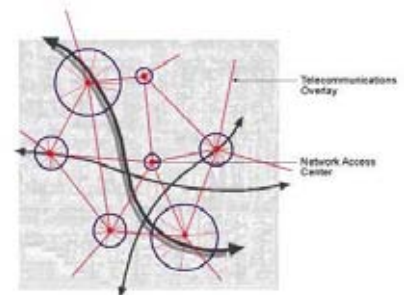
At the local scale, Hudson County exhibits a wide array of neighborhoods from those that are closely linked to high technology infrastructure and services to others that are seemingly isolated from all of the recent development efforts along the waterfront. Recognizing the diversity of the existing physical, economic and social context, the use of digital technology provides a number of opportunities to redress the gaps in investment and skills that are noted in previous planning efforts.

Below are some opportunities that Hudson County can consider in supporting redevelopment in older urban neighborhoods:

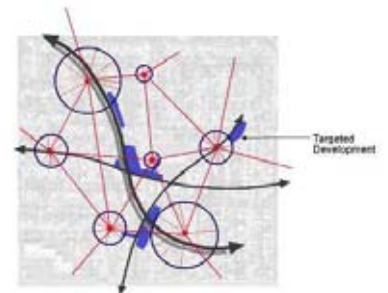
- *Creating opportunities for neighborhood economies to flourish* Before the industrial age, work was nearly always performed in, adjacent to, or near the home. The centralization of work in factories was required by the physics of the day – energy had to be produced in large quantities to be economical. However, as infrastructure technologies continue to become smaller and smarter, work can move back into the home or, local shared offices, which potentially reduce the demand on transportation systems during peak hours.
- *Reinforcing the local identity of places.* Integrating IT and training or creative production into existing assets can re-create the meaning and importance of traditional neighborhood center such as libraries and schools.



EXISTING URBAN PATTERN



NETWORKED URBAN PATTERN

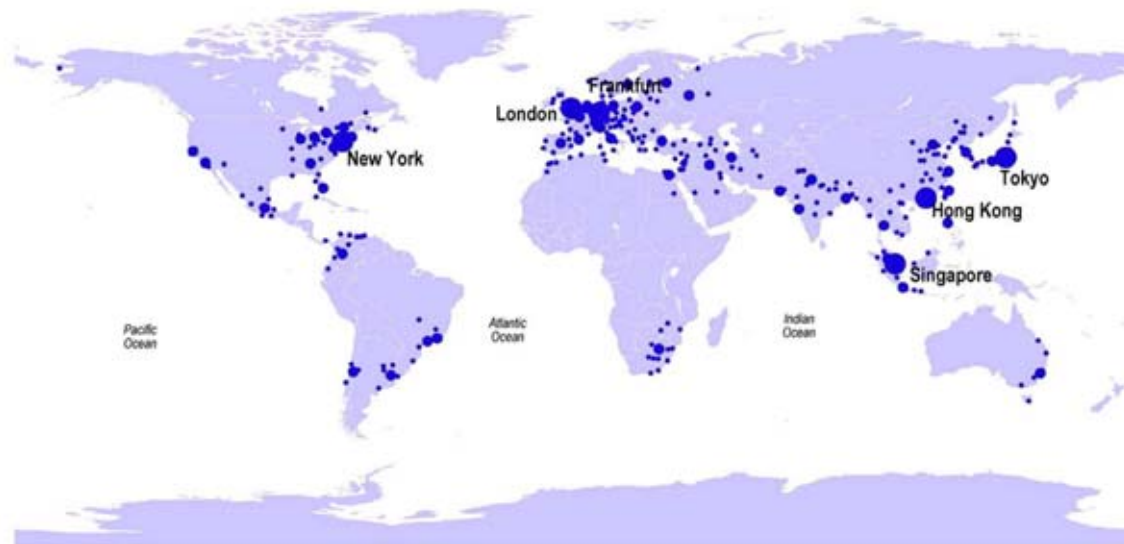


RECOVERED URBAN PATTERN

- *Industrial buildings are ideal for information businesses.* The stout warehouses and factory lofts that supported industrial age manufacturing and artisans are ideal for the requirements of many information businesses. Industrial buildings that feature heavy load-bearing floors for computer equipment and air conditioners, multiple power grid connections, and loading docks make many older central cities ideal sites for world-class telecommunications nodes.
- *Enabling production and creative processes from the neighborhood level* – Technology can be used as a means to add value to deteriorated neighborhoods where services are not readily available. Creating access to technology for low-income residents and, more importantly, giving them the tools to learn valuable skills, will greatly enhance their ability to begin small businesses.
- *Creating mixed-use neighborhoods without bricks and mortar construction* – From senior services to retailing, many of the services not found in deteriorated areas can be delivered through network technology.

The most promising cyber strategies are just beginning to emerge. Hudson County has the opportunity to distinguish itself by becoming an international leader in breaking new ground by adopting an innovative Cyber Strategy linked to long term economic benefits.

GLOBAL CITIES



4.0 CYBER STRATEGY PROFILES

4.1 CYBER INDUSTRY CLUSTERS

4.1.1 TeleCom City, Malden/Everett/Medford, Massachusetts

Key observations:

- Cyber technology is often perceived as a touchstone. A vision that incorporates a reference to cyber technology can be strong enough to galvanize political support for what is actually a standard commercial development. However, when the vision does not include comprehensive quality of life concerns and does not incorporate local support, even a cyber vision will not hold the political coalition together.
- Basing the vision narrowly on the prospect of attracting a particular industry or segment risks the prospect of industry decline or disinterest by the target businesses.
- Land developments, regardless of the cyber vision, that require the support of a political coalition of cities, developers, and state agencies for greater than a four year period are vulnerable to the electoral politics of the government partners.

Cooperating Across Municipal Boundaries for Brownfield Redevelopment

The Mystic Valley was once home to national and international leaders in emerging chemical production, coal gasification, and manufacturing such as Allied Chemical, Monsanto, and Converse Rubber. Industry utilized the Malden River to transport products and raw material to and from Boston Harbor. After a steady period of decline, however, the area is now home to a large number of vacant buildings where redevelopment has been complicated by contamination and fragmented ownership. The three adjacent communities of Malden, Everett, and Medford have a population of approximately 142,000 and are located in the inner suburban loop, 5 miles from Boston. The area is heavily urbanized and there is no green space available for new industrial development.

Where the three towns converge along the river, over 200 acres of unused land was sitting idle. The three cities, which had traditionally been rivals, demonstrated cooperation to combine resources and collaboratively pursue a redevelopment solution. As one reporter wrote, “the idea was as unthinkable as merging the high school football teams.” But, together local leaders developed a vision for the remediation and redevelopment of the site as a research and development hub for the state’s thriving telecommunications industry.

In July 1996, the Massachusetts state legislature created the Mystic Valley Development Commission (MVDC) to direct the redevelopment of 200 acres of polluted industrial property. The commission includes seven members: the mayors of Everett, Malden, and Medford; a designee from each mayor; and the governor or her designee (currently John G. Troast Jr., of the state Department of Economic Development).

It has considerable authority to carry out the development of TeleCom City, including taking property by eminent domain and creating uniform real estate tax and zoning rules for the entire project area. In total, Telecom City is expected to cost taxpayers \$100 million, and create over 7,500 jobs. Over 1.8 million square feet of new office space will be constructed on the 200-acre site.

In October 2000, the EPA recognized the Mystic Valley Development Commission (MVDC) as one of 12 new Brownfields Showcase Communities, out of 26 nationwide. To date, the MVDC has received over \$1.25 million in brownfields funds and assistance from the EPA for remediation of the TeleCom City site.

Failing to Define a Complementary Vision Destroys Coalition

While the towns were able to reach a consensus about the need to redevelop the site, they failed to agree on a strategy that included the firms they were trying to attract, developers, and local residents. As a result, relations between MVDC, cities, and developers have collapsed into mud-slinging and lawsuits.²

The 200 acre brownfield site presented many opportunities including a scenic river, nearby transit, good highway access, and proximity to Boston's Logan airport. The New York-based developer's proposal eventually chosen by the MVDC was a complex consisting of 1.8 million square feet of office, research and development, and manufacturing space as well as a riverfront park and green space for local residents. Zoning regulations adopted in 1999 limited land use in new and existing buildings to the telecommunications industry, and have been the target of lawsuits by property owners. Finally, neighborhood residents have opposed numerous aspects of the TeleCom City proposal, claiming that over-development would damage their quality of life.

As a result, movement has been slow on the project. Five years since the inception of MVDC, basic road improvements have not even begun. The major commercial use of the site is still warehousing, such as the 10,000 square foot Heritage Foods warehouse.

Cyber strategies need to be future-proofed

TeleCom City's narrow focus on the telecommunications industry is now a threat to the project's feasibility. While useful in developing the initial vision needed to catalyze action at the state and local level, the collapse of the telecommunications industry has rendered the strategy far less desirable.

This experience holds an important lesson for cyberdevelopment planning, since in the five years it has taken the TeleCom City idea to go from planning to construction, the telecommunications sector boomed, prospered, and busted. This experience suggests that a good deal of future proofing needs to be built into cyberdevelopment strategies. Rather than focus on key industries or firms, strategies should focus on building the capacity to create new firms. These include education, financing mechanisms like venture capital, and basic physical infrastructure.

Quality of life is a critical part of any information age development strategy

Original plans for TeleCom City did not call for housing as an integral part of what was primarily a commercial development plan. But as local understanding of cyberdevelopment progressed, it became clear

that attracting high-tech firms also meant attracting the talent they would require. Good schools, housing, and recreational opportunities have thus become integral to the TeleCom City plan.

In the 1990s, the local schools were in a poor state. However, Malden has recently spent over \$120 million of state and local money on five new schools and an early childhood education center. While Medford and Everett have yet to take action, it is clear that the change in the local school system is having a significant impact on property values and tax revenues within the city.

Housing shortages, already a problem before the new development at TeleCom City, is an important local issue. Furthermore, the quality of housing adjacent to the site was not deemed adequate for attracting the highly-skilled workers of a future TeleCom city. To address both supply and quality issues, MVDC revised its original plan for the site to include 520 units of housing. To this end, it has expanded the boundary of the site and begun planning 150 units on the annexed area.³

4.1.2 Digital Media City, Seoul, South Korea

Key observations:

- Social capital must be created and nurtured through a broad variety of institutions and networks.
- Effective marketing is critical to the successful development of a cyberdistrict

In 2001, South Korea emerged as the world's most connected society. With over 8 million high-speed subscribers, it leads the world in residential broadband penetration. In some apartment complexes over 75 percent of homes subscribe to broadband service. Every new apartment building is wired with fiber optics, and many older buildings have been retrofitted. As the collapse of competition slows broadband adoption in Europe and the United States, Koreans continue to flock to the broadband lifestyle. Even those few who lack a high-speed line at home, over 15,000 Internet cafes offer a high-speed connection to anyone with a few hundred won.

This connectivity is not limited to the desktop. With mobile phone penetration rates well over 60 percent, Korea is among the world's wireless leaders. While most other countries are still just talking about third-generation (3G) broadband wireless, Korea has over 1.2 million high-speed mobile users.

A New Cyberdistrict for Seoul: Infrastructure Is Not Enough

As the center of Korean culture and commerce, Seoul is the world's most wired city. Yet despite this endowment of advanced communications infrastructure, Seoul has struggled with cyberdistrict development as it tries to launch Digital Media City. Digital Media City (DMC) is major new development planned for one of the last large tracts of undeveloped land within the Seoul metropolitan area. Adjacent to the 2002 World Cup Stadium, the site was cleared and prepared with basic urban infrastructure by the city government – sewer, water, power, roads, and fiber optics.

But even as land in the DMC project goes to market in early April, the failure of project planners to look beyond the challenges of physical planning has jeopardized the long-term success of the DMC. Put simply, cheap land is not enough to entice the first-tier anchor institutions the DMC sees as critical to developing a major media and entertainment cluster.

Vision, marketing and public relations

As the DMC project land goes to market, it is tremendously under-valued because of a lack of marketing and public relations efforts on the part of the Seoul city government. This poor marketing effort is largely due to a failure to develop a compelling vision of what the DMC is really about.

Originally, the DMC was envisioned by the city government as a new town development where Korea's emerging new media industry could be given a place to nest and develop into a dynamic, entrepreneurial cluster. Yet project planners did a poor job of understanding the actual dynamics of the industries they were trying to nurture. On the one hand, they sought innovative media and entertainment firms in animation and film, both fast growing sectors in Seoul. On the other hand, they sought information technology firms.

The preferred strategy for luring these two types of industries are very different, and require very different types of facilities. On the one hand, media and entertainment firms tend to prefer lively, diverse urban neighborhoods with “buzz”, while information technology firms prefer quiet, secure locations outside the dense urban core. The failure to develop a vision of the DMC as one type of cluster or the other, and a compelling marketing campaign to sell that vision to either industry has devastated the DMC project. The resulting vision, which tries to be everything for everyone, is nothing for anybody. Its messages are vague, confused, and uninformed.

Building Supporting Social Networks

A critical failure in the visioning and development of Seoul DMC was that its planners failed to understand the complex social and economic dynamics of entrepreneurial clusters. As numerous studies of Silicon Valley have shown, social networks are the critical success factors in the process of cyberdevelopment. Yet little in the DMC vision or plan was targeted at developing these critical social networks. DMC's planners assumed that if they made a place to do business, firms would magically appear, without considering the opportunities and obstacles for firm creation in the first place.

4.1.3 Plug 'n' Go/Digital New York, New York City

Key Observations:

- A cyber industry cluster has its own dynamics that the local government can reinforce but which are hard to create from whole cloth.
- A successful attraction and retention strategy needs to be broad and rely upon a multitude of linked incentives and subsidies that can include a cyber infrastructure component.

- Timing is important – a thorough understanding of the target industries is critical and should rely upon advisors with direct experience in business.
- Cyber infrastructure cannot overcome other market conditions.

New York City's Silicon Alley is one of the world's leading cyberdistricts, and contributed significantly to the city's and the region's economic growth during the 1990s. During this period, various city agencies and non-profit organizations collaborated to provide a better environment for small, innovative firms to prosper. At its height in 2000, Silicon Alley employed some 250,000 persons across the New York region, up from 106,000 in 1997. It contributed tens of billions of dollars to the regional economy.

Silicon Alley emerged in lower Manhattan in the early 1990s. The cluster of firms stretching along Broadway from the Financial District to 23rd Street was largely formed through synergies between several key sectors of the New York economy - advertising, broadcasting, publishing, visual arts, and software design. While entrepreneurial energies drove the growth of this innovation cluster, the New York City government took several steps to remove obstacles and foster growth in what was loosely termed the "new media" industry.

New York's new media firms were among the dot-com boom's biggest names. Community sites like ivillage.com and theglobe.com grew quickly, launched outrageously overvalued public stock offerings, and then promptly collapsed when they could not generate sufficient revenue through advertising alone. Others, like online advertising giant DoubleClick, grew and contracted more slowly.

Defining the new media industry remains a challenging task, making it difficult to estimate its impact on the New York City economy. Yet by almost any definition, in terms of employment and income the effect was significant. The New York New Media Association (NYNMA), a trade group representing new media firms, defines new media as a combination of "computing technology, telecommunications, and content, to create products and services which can be used interactively by consumers and business users."⁴ The difficulty enters when one considers that many new media "employees" are actually contained in the interactive divisions of larger traditional media firms and thus do not show up in government statistics as employees of new media firms.

Fostering Cyberdevelopment Through Diverse, Linked Initiatives

The key to New York City's strategy for fostering the growth of new media enterprises was its broad range of subsidies, tax breaks and incentives. Rather than rely upon a single, comprehensive strategy developed in isolation from industry, a variety of city agencies developed highly targeted programs aimed at removing obstacles to the growth of small, innovative technology firms.

Some of the city's many initiatives include:

Public venture financing. Established in 1995 as a venture capital fund, the Discovery Fund invested in New York City-based emerging advanced technology companies. The fund was created by the Giuliani administration in May 1995 and capitalized at \$76 million. By 1999, the fund had invested in 11 companies, several of which had highly successful IPOs. The fund's manager's have also courted new investors including Brooklyn Union Gas, Con Edison and the New York Power Authority.

Cheap, wired office space for startups (Plug'n'Go). In early 1997, the New York City Economic Development Corporation initiated the Plug'n'Go program, which offered small offices in six privately-owned buildings in Lower Manhattan. Directed and financed by the New York City Economic Development Corporation, the program consisted of three strategic actions that worked together to create a business-friendly environment in downtown Manhattan:

- **Telecommunications infrastructure.** As the buildings were mostly older, non-prime office space, infrastructure improvements were necessary to accommodate technology companies.
- **Rent subsidies.** To attract small startup companies, rent for spaces as small as 1,000 square feet were fixed at \$15 per square foot, about 35% below market. In just 10 months, 180,000 ft² of space was leased to 79 new media companies under this program.
- **Advertising and marketing campaign.** Over \$800,000 was spent on advertising and marketing the Plug'n'Go program, including \$400,000 in pro bono advertising work, \$200,000 from NYCEDC, \$200,000 from the Alliance for Downtown New York, and \$50,000 from the building owners.

Plug'n'Go was so successful that by 1999 all 14 buildings that ultimately participated in the program were fully leased.

More cheap space for a booming industry (DigitalNYC)

Plug'n'Go was such a success that the city decided to try again, but this time outside Manhattan. As the Manhattan economy boomed in the 1990s, it absorbed the tremendous amount of excess office space developed during the speculative craze of the 1980s. It became increasingly clear that future expansion of the city's information-based economy rewired new office construction both in Manhattan and in the secondary business districts in Brooklyn, Queens, and the Bronx. DigitalNYC was launched in May 2000 with \$2.5 million of funding from the city's Economic Development Corporation. The new program called for deflecting some of the space crunch in Manhattan to seven neighborhoods outside the Manhattan central business district.

But by the time DigitalNYC was launched, the rapid decline of the new media industry in Silicon Alley was well underway. Combined with the effects of the shrinking financial services industry, it soon became clear that DigitalNYC's plan to deflect business expansion from the crowded Manhattan market was no longer a feasible strategy. Only one of the seven neighborhoods in the program, Brooklyn's DUMBO had any success, and it is doubtful that DigitalNYC was responsible for these good fortunes. Of the 600,000 square feet of leasable space involved in the program, only 20 percent was occupied.

4.1.4 Oakland, California⁵

Key Observations:

- Small business incubators are a practical, cost-effective way to begin harnessing local entrepreneurial activity
- Even a successful incubator will not help overcome deficiencies in poor human capital assets citywide.

Historically a manufacturing center and transportation hub, Oakland experienced similar losses in heavy industry in the post-war era. However, like Hudson County its location at the center of a booming region has brought new investment and jobs in high technology and information economy businesses.

The Spillover Effect

Like Hudson County, Oakland has benefited enormously from its proximity to a major global business center. A booming economy and constraints on new development within the city of San Francisco helped make it the third-most expensive office market in the United States after New York and Boston.⁶ Also like Hudson County, Oakland boasts an impressive physical infrastructure including an international airport, railroads, transit, telecommunications, and trendy industrial loft buildings.⁷

In the late 1990s, Oakland began to experience the same kind of high-tech information economy growth that its neighbors to the south and west in San Francisco and Silicon Valley had enjoyed since the 1970s. The city is now home to over 300 high-technology firms that brought an additional 13,285 jobs to Oakland between 1994 and 1999. About 80 percent of these firms are in the software industry, and a handful in telecommunications and biotechnology.

Oakland's growing high-technology industry is largely attributed to the skyrocketing cost of office space in the San Francisco Bay Area. For example, prime office space in Oakland at the end of 2000 rented for about \$30-35 per square foot, half the going rate in San Francisco or Silicon Valley. Class B rents, at \$18 per square foot are unrivaled anywhere else in the region.

Starting Smart with Small Business Incubators

The City of Oakland has implemented a number of economic development strategies to support the growing local high-tech sector. In particular, it has developed two successful small business incubators.

- In 1993 the city developed its first general small business incubator, the Oakland Small Business Growth Center. Recent graduates of the incubator have been able to secure more than \$10 million in private capital.
- In 1996, Oakland opened the Communications Technology Cluster (CTC), located in the historic landmark Rotunda Building in downtown Oakland. CTC is a public-private partnership between Sustainable Systems, Inc., the Oakland Business Development Corporation, and the City of Oakland. It provides strategic and business services for high growth potential companies in various technology sectors. Since 1999, CTC graduate companies have gone on to raise \$220 million in external funding.

The Oakland Small Business Growth Center contains 19 businesses and employs over 40 people. There are over 30 firms housed in the Communications Technology Cluster employing 120 people. Both facilities offer shared business services, training, and technical support at attractive rents.

However, the city has failed to capitalize upon the successes of its incubators. Only one of six firms that have graduated from the CTC has stayed in Oakland. As a result, the city now requires all tenants at its incubators to sign a good faith agreement to stay in Oakland – however; the power of this agreement is limited.

Restructuring small business taxes

Oakland’s high local business taxes require small technology firms to pay \$1.80 in license fees for every \$1,000 in gross receipts, compared to just 40 cents in neighboring Alameda. The city has begun addressing this problem by passing a Business Tax Incentive Program to phase in the tax over a ten year period, with a \$150,000 maximum cap for firms in five targeted industries including software, telecommunications, and biotechnology.

Marketing Oakland

Oakland is not waiting for new firms to come looking for space. Two full-time employees on the city’s economic development staff actively recruit new firms, and the city signed a \$2 million marketing contract with New York-based advertising firm Young & Rubicam in 1999.

Lingering Impediments

Seventy percent of the adult population of Oakland lacks a college degree. As real estate analyst Joel Kotkin notes, the high-tech slump could affect Oakland very strongly since it is still the second choice of most companies. As space crunches in the rest of the region ease, Oakland’s poor human capital assets will make it an increasingly less attractive location for new and expanding firms.

Oakland continues to deal with human capital issues that are very similar to Hudson County.

4.2 CYBER INFRASTRUCTURE AND MARKETS

4.2.1 Civic Net; Chicago, Illinois

Key observations:

- A strategy supported by a coalition of interests has a better chance of advancing than if it is promoted by a single jurisdiction. In this case, the dominant metropolitan government asserted its leadership in order to form the coalition.
- The strategy grew out of a marketplace opportunity to aggregate buying power in order to create the equivalent of an extensive public-private metropolitan area network (MAN). Since economic development requires access technologies, skill sets, business practices, and motivation to innovate as well as adequate bandwidth in the infrastructure, it is not clear whether a purely infrastructure strategy will succeed in its ambitious goals of reinvigorating neighborhood economies and countering the “digital divide”

- The strategy is in early stages of development. It will require monitoring in order to draw more substantive lessons.

The Broadband Digital Divide

Ensuring widespread, even universal, access to communications networks had been a hallmark of federal communications policy for nearly a century until cities began to be rewired with cable in the 1960's and with additional infrastructure during the 1990s. While in the past widespread service had been achieved through tight regulation of private monopolies like AT&T and the Bell companies, in the New Economy the federal government stepped back to let competitive market forces drive the diffusion of new communications infrastructure.

Competition appeared to work well at first. The fiber optic boom of the late 1990s resulted in the deployment of over ten million miles of fiber optic cable within major cities in the United States. Another five million miles was strung between these cities, alongside highways and railroads.

But while ten, twenty or even thirty competing fiber optic grids now serve most downtowns in North America, nearby residential neighborhoods and smaller ancillary business districts remain underserved. Similarly, while big cities became hubs for transcontinental fiber networks, medium- and smaller-sized cities would be lucky to have a handful of fiber connections to the rest of the world. Put simply, many local communities – especially inner-city neighborhoods – suffer from a broadband “digital divide”.

This broadband divide will have serious long-term economic impacts on Chicago's neighborhoods. As Mayor Daley put it, “Fiber-optic cable carries high-speed communications across the continent and around the world. If you're near where the fiber is, and if you've been trained, the opportunities seem limitless. It's not unlike the spread of railroads in the nineteenth century. If the transcontinental tracks came through your town, prosperity followed. If it didn't, you were out of luck.”

Chicago's Infrastructure Plan: CivicNet

To address the broadband divide, Chicago launched the CivicNet program in 2000. CivicNet is a cyber strategy with the economic development goals of attacking the “digital divide” and bringing more jobs into the City. CivicNet is a fiber network that will connect 1,600 municipal buildings, schools, public housing developments, police/fire stations, and all other civic operations in neighborhoods throughout the city. The plan is to bring fiber to the curb (FTTC) in every neighborhood in Chicago through an innovative leveraging scheme.

The central business district has a robust fiber infrastructure, which supports intense commercial activity. The City hopes that the fiber network will stimulate investment in the neighborhoods which once contained manufacturing activity. According to its project director, Doug Power, CivicNet will get companies to bring their businesses and high-paying jobs to Chicago. The hope is to close the “digital divide” that follows spatial lines particularly in the inner ring suburbs around the central business district and in the near south side.

The plan for CivicNet calls for aggregating the purchasing power of city agencies, the park district, the housing authority, transit authority, city colleges, and the school district. Previously, each entity usually contracted separately for its own voice and data telecommunications services. Combined, the aggregated demand constitutes an anchor tenant for a digital network with \$31 million of purchasing power annually. The program would seek to leverage this to generate \$250 million in infrastructure investment over the next 10 years.

The aggregator will guarantee the chosen network vendor its business for the next 10 years with an option to extend the contract to 25 years. The City will also provide its spare fiber and space in city buildings for use as node sites or central offices, as well as the rights-of-way to existing infrastructure including ducts, conduits, freight tunnels, and rapid transit lines.

The plan is to guarantee a revenue stream and contribute existing resources so that the cost of building digital network infrastructure into the neighborhoods will be low enough to be a feasible business for a private telecommunications carrier.

The city of Chicago is currently soliciting proposals from carriers for the contract to build CivicNet.

4.2.2 GTE Smart Parks and Smart Centers

Key Observations:

- Modest benefits, in this case improved absorption rates, were realized through modest industrial and commercial developments enhanced by technology.
- Management support in a private sector initiative is equivalent to political support in a public sector led initiative. When management – or elected officials– change, initiatives are vulnerable to cancellation.

In the mid-1980's, the formerly independent ILEC (incumbent local exchange carrier) GTE developed a program for using telecommunications to enhance the value of real estate. The program was known by the trademarked names *Smart Parks* (applied to low density business parks) and *Smart Centers* (applied to high rise office buildings).

The *smart* program had three components:

- Infrastructure
- Marketing
- Developer relationships

The infrastructure included a fiber/copper combination between and within buildings with SONET capability in, for example, a business park of 200 acres. These high capacity connections between buildings gave multi-building tenants the functionality of single building occupancy. In some cases, the development included a remote central office switch onsite. Such a facility would allow all tenants to obtain DSL service, regardless of the distance to the actual central office. The infrastructure also allowed fast deployment of high speed products such as T-1 and T-3 in one week rather than the typical 60 days.

Although the program was based on an agreement between GTE and a developer, the result was generally embraced by the local jurisdiction as a strategy for developing and marketing commercial and industrial property.

The program was actively offered to developers for fifteen years. It was terminated in August, 2001 by Verizon management. Verizon is the company that resulted from the merger of GTE and Bell Atlantic. The former Bell Atlantic management, as the larger of the two merged companies, tends to dominate policy.

Although current Verizon managers were not available for comment, the former head of the program for GTE speculated on the reasons the project was cancelled:

- Bell Atlantic disliked the relatively high front-end investment.
- GTE was generally more aggressive than the former RBOCs (Regional Bell Operating Companies), including Bell Atlantic, in fiber deployment.
- *Smart Parks* and *Centers* did not originate in the Bell Atlantic culture and therefore lacked long term support.
- Verizon, like other ILECs, wanted to reduce staff. Eighteen people worked in the *Smart* Program.

During its fifteen-year life 175 developments were included in the *Smart* program. They were concentrated in California but also included developments in Washington, Oregon, Texas, Indiana, Pennsylvania, and Ohio.

Although the conclusion is unsubstantiated by data, both the GTE program head and the economic development director for the City of Oxnard (home to one of the original Smart Parks) believed that the impact of the enhanced infrastructure was a faster absorption rate, not higher lease rates. In the Oxnard case, the Smart Park helped overcome a location deficiency of poor freeway access.

4.2.3 Metropolitan Area Network, Pasadena, California

Key Observations:

- Fiber MANs can be cost-effectively developed when based on a local jurisdiction's need to upgrade its copper network infrastructure.
- The private entity in the public-private arrangement proved to be unable to sustain its participation, handicapping progress toward the economic goals.
- Three years after the MAN became operational, virtually no progress has been made toward the economic goals. As mentioned in relation to Chicago's Civic Net, access technologies, skill sets, business practices, and motivation to innovate are required in addition to adequate bandwidth for capturing economic benefits. The Pasadena example reinforces the caution that purely bandwidth strategies may not be sufficient for achieving economic development goals.

The City of Pasadena owns the local water and power utility. In 1996, the Department of Water and Power needed to replace the copper wire network that connected its various electric sub-stations and water distribution facilities. In addition, the de-regulated power market raised the specter of needing to offer new services that would improve DWP's competitiveness. Since the marginal cost of adding fiber strands is quite low, a plan was proposed for building a 19-mile backbone network with 144 fiber strands. This high capacity backbone led to the search for additional users and uses.

The Pasadena City Council adopted in December, 1997 a resolution by which the DWP would use \$1.7 million of capital reserve funds to build and maintain the proposed backbone network. The benefits that were expected from this investment include the following:

- Attraction of new businesses with needs for broadband services, including high technology, biomedical, entertainment, and engineering firms.
- Retention of existing businesses with significant telecommunications requirements, such as engineering and environmental consulting firms, California Institute of Technology, the Jet Propulsion Laboratories (JPL) and its subcontractors, the Huntington Memorial Hospital and various financial institutions.
- Reduced rates for telecommunications services for local businesses, governments, schools, and residents.
- Revenue derived from licensing the largest portion of the network to a competitive local exchange carrier (CLEC) to market services locally.

Construction of a 25-mile backbone network (slightly larger than planned) was completed in 1999. An RFP was issued in order to select an ILEC to commercialize 120 of the 144 fiber strands. GST Telecom was selected and agreed to pay the City \$1 million per year for the exclusive lease. That fee was paid for only 1999 and 2000, at which point the fee was renegotiated to only \$100,000 per year. The first two payments repaid the City for its initial investment. Time-Warner Telecommunication purchased GST Telecommunications in 2001 and is currently renegotiating other terms of the GST agreement with the City.

As of February, 2002, none of the 120 commercial fibers are in use as none have been lighted. Time Warner has exceeded the six months window for making the network operational before falling into breach of contract. That is one of the issues being renegotiated.

DWP is using some portion of its 12 fibers as planned. The City Information Technology controls the remaining 12 fibers and 2 have been lighted so far. JPL and Caltech have contracted these for use. Some of the remaining 10 will be lighted this summer as replacements for T1 lines leased from Pacific Bell to connect remote facilities to the City's payroll, GIS and e-mail systems.

The only economic benefits to come from the network so far have occurred through the subcontracting policies of JPL. JPL has required all of its subcontractors to locate somewhere along the route of the City's backbone in order to have access to JPL's wide area network (WAN). So far Raytheon has located an office in Pasadena and two other firms are about to open satellite offices there. There were already 12 subcontractors in town.

The City commissioned an assessment of the local telecommunications market in 2001. The study discovered the following:

- The larger businesses were satisfied with Pacific Bell's (ILEC) services.
- Wireless coverage needed improving.
- City should conduct a long range, integrated planning process for network needs to replace the existing short term, department by department process.
- There was no business case for the City extending its network to residential areas to provide cable television service.
- There are other CLEC facilities that pass through Pasadena but none of the vendors were marketing to Pasadena businesses.

4.3 CYBER ACCESS AND APPLICATIONS

4.3.1 Blue Line Televillage, Compton, California

Key Observations:

- Strategies that integrates land use, transportation, network access, network applications, and network services can lead to specific economic and mobility benefits.
- This single facility demonstration project would have been more effective if additional facilities at different locations had been added. In other words, a system of such facilities is needed.
- Network access centers can be successfully designed to reflect the needs and interests of the surrounding community through a community-based planning process.

Los Angeles County has a population of 9 million people. The single occupant automobile is the dominant form of transportation where it accounts for 9 out of 10 trips. Only 3.4% of trips utilize public transit. Continued construction of an underground rail system is imperiled due to its cost that exceeds \$400 million per mile. Traffic congestion and air quality are among the worst of any city in the USA.

Although the Southern California regional economy is by itself larger than all but 8 nations in the world, there are large pockets of persistent poverty. Living density is relatively low due to the dominance of the single family detached housing unit. Low density and a relatively high level of violent crime have reduced the sense of community and the vibrancy of public places.

Following the 1992 civil disturbance, as part of its search for affordable solutions to regional mobility, the Los Angeles County Metropolitan Transportation Authority funded development and implementation of the prototype Urban TeleVillage. The facility was adjacent to its Metro Blue Line surface rail system that runs for 26 miles between the central business districts of Los Angeles and Long Beach. The site of the demonstration project was the City of Compton, a racially mixed, low density suburban community with an average household income about 50% of the County average. Over 130,000 people lived within two miles of the site.

The prototype, known as the Blue Line TeleVillage cost \$654,000 and required 30 months to plan, develop and operate (for a 12 month period). The demonstration year was completed March 1, 1997, and the facility remains in operation. The Project was managed by the Drew Economic Development Corporation (a community based non-profit corporation) and designed and developed by Walter Siembab. The design is based on a Cyber Strategy developed by Mr. Siembab. ISDN network services were provided by Pacific Bell as part of its Education First Program.

The Cyber Strategy defines a practical method to spatially re-organize urban functions in order to meet four goals related to livable communities and sustainable cities:

- Enhance mobility while reducing dependence on the automobile,
- Foster local economic development,
- Provide universal access to broadband telecommunications services, and
- Reinforce face-to-face community and neighborhood identity.

The Blue Line TeleVillage Demonstration Project used off-the-shelf telecommunications and computer technologies to replicate the functions of a traditional village center. A combination of telecommunications and public transit (bus and rail) was used to initiate improvements in mobility and economic opportunities.

The Blue Line TeleVillage includes a Telework Center, Computer Center, Videoconference Center, kiosks, and a large meeting room. It provides low cost access to a range of services, information and transactions. They include distance education classes, library story telling for children, computer classes, internet access, business mentoring, voice mail, telework stations, public access computers, bank ATM service, and more.

The Blue Line TeleVillage was designated “Best Practices In California” by Tech Expo in 1996 and qualified as a “Semi-Finalist” in the 1996 National Information Infrastructure Awards even before the facility was open. The project recently received the 1997 Excellence in Innovation Award by the International Telework Association. It was featured in a vignette carried by the CSPAN cable network.

4.4 VAPOR WARE

4.4.1 Baltimore

Key Observations:

- Articulating a comprehensive strategy and vision is the first step towards creating a cyberdistrict
- Successful cyberdistricts require governance mechanisms and institutions to sustain momentum.
- Effective marketing and public relations can create lots of value even without real action.

Like Oakland and Hudson County, Baltimore, Maryland suffered a long period of decline in the second half of the 20th century as inner-city factories, shipyards, and railroads left for the suburbs and other parts of the country. However, Baltimore is trying to develop its capacity to create wealth in the information economy through a comprehensive strategy dubbed the “Digital Harbor”.

The Digital Harbor project seeks to create 55,000 jobs over the next decade. The Baltimore Development Corporation has asked the state of Maryland for \$300 million in infrastructure improvements over a five-year period, which it believes can be used to leverage \$4 billion in private investment.

The Digital Harbor - A Holistic Strategy

The most striking feature of Baltimore’s plan is its comprehensive approach – it contains strategies for dealing with infrastructure, education and workforce development, financing, and marketing. – what were the strategies?

Baltimore’s approach is not just limited to the city’s waterfront or its neighborhoods, but includes the entire region. According to the Digital Harbor website:

“The Digital Harbor” is a name for the entire region - Baltimore’s Inner Harbor is at the epicenter of an expanding cluster of technology-driven companies and universities that form a regional “technology watershed.” It starts in Baltimore City’s waterfront neighborhoods, like Canton, Locust Point and Fells Point, then extends beyond the waterfront to other great Baltimore’ neighborhoods - along the Jones Falls valley to the north, around Carroll Park to the west, and surrounding Johns Hopkins Hospital to the east. The Digital Harbor continues beyond Baltimore City to include the people and companies in Baltimore County, Carroll County, Anne Arundel County and Howard County that make up the membership of groups like the Greater Baltimore Technology Council.”

Unlike Seoul’s Digital Media City, Baltimore has created a vision for Digital Harbor that includes aspects beyond the provision on technology. The remarkable clarity of promotional materials and speeches given by Digital Harbor advocates like Baltimore’s mayor Martin O’Malley have given the project a tremendous push forward from the beginning.

A Vision Unrealized

Despite the vision that has been developed and articulated through Baltimore’s extensive and effective public relations and marketing campaign, Digital Harbor remains little more than a brand.

According to local economic development staff interviewed for this study, the city has failed to create governance mechanisms and institutions that can sustain interest and activity in Digital Harbor. Furthermore, Digital Harbor’s advocates have failed to develop a comprehensive physical plan that will help them achieve the vision of Baltimore’s future that they have put forth. Most of the specific physical proposals the city has put forth as “Digital Harbor” initiatives were just redirected or borrowed from existing proposals and repackaged. Monies for Digital Harbor were mostly shifted, turning Digital Harbor in many ways into a strategy for selling city requests for state aid.

At its core, Baltimore's Digital Harbor initiative remains an unrealized plan, mainly due to its over-emphasis on branding and marketing, and failure to develop a comprehensive physical development plan. It should not be ignored though, that a tremendous amount of value has been generated without laying a single brick.

REFERENCES

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