Digital Broadband Networks for Economic Development and Mobility: A Bricks and Bits Strategy for Retrofitting Cities

Recommendations Based on the Blue Line TeleVillage

Walter Siembab and Thomas O'Brien
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A Bricks and Bits Strategy for Retrofitting Cities

The rapid pace of telecommunications advances has left many of the least well-endowed potential users confused about what it all means. Municipal governments as well as community-based non-profit corporations, educational institutions, and small businesses typically lack the resources to develop new strategic plans, or even to conduct ad hoc demonstrations and pilots. As a result, deployment of these new devices has been largely tactical, limited to upgrading existing systems (e.g., a new PBX), integrating stand-alone computers into local area networks, or creating web pages for the Internet.

This article presents the proposition that digital broadband networks are capable of inducing dramatic improvements in both ground transportation and local economies. The mechanism for realizing that potential is a public-private development strategy for retrofitting cities and regions with non-commercial broadband networks.

This strategy will deploy networks and network access centers, in combination with other supportive policies and programs, to re-organize urban sprawl into a system of neighborhoods and villages. This promises to stimulate transportation innovation and to introduce a more even economic development process that will, over time, counter the tendency to spatial concentrations of wealth and poverty.

We call this a *bricks and bits retrofit strategy* because it deploys digital broadband networks with non-commercial community access at strategically located physical centers.

New Tools and Old Problems

Low income communities throughout the country are trying to figure out how to get a bigger piece of the action. The data for the post-war decades reinforce the old cliché that the rich tend to get (relatively and absolutely) richer. E-commerce, currently the domain of an active minority, threatens to exacerbate this condition.

Most cities have experienced widening income and wealth disparities based at least in part on barriers to labor market entry which, 50 years ago, required only a high school diploma and good health. With a dearth of good paying industrial jobs, labor market

access now often requires a college education, computer skills, specialized know-how and capital.

Meanwhile, on the other side of the tracks, middle and upper class communities are trying to identify an affordable strategy for improving mobility. Most cities have experienced over-utilization of single occupant fossil fueled vehicles resulting in traffic congestion, air pollution and under-utilization of public transit, walking and alternative fuel vehicles. Sometimes the structural problem can be traced to a sprawl urban form and sometimes to excessive density in which automobile use remains the dominant form of transportation despite access to public transit. In any case, more highway capacity has proven neither effective nor affordable.

Local governments and their public-interest partners such as school districts, state and federal agencies, regional transportation authorities, and metropolitan planning organizations have been unable to reverse these trends in economic distribution and ground transportation despite billions of dollars of public investment.

So, as Monty Python used to say, "and now its time for something completely different." A strategy based on broadband network technologies may be that something.

Network Transmission and Access

It is useful to distinguish between two broad categories of network function. Network *transmission* is represented by the telephone bill with charges for dial tone and for network usage related to time of day, length of call and distance of call. In the United States, public subsidies for transmission have become associated with the policy of "universal service."

The second category can be referred to as network *access*. Access means literally "the ability to enter." Access technologies, such as telephone handsets, computers with modem, video conferencing units, and kiosks, are needed for a consumer to enter the network (i.e., utilize network transmission services). These are usually capital expenses and are not addressed by the existing "universal service" policy based on the 1996 Telecommunications Act.

Access technologies determine or limit the nature of the network application available to the user. For example, a computer and a telephone handset define different types of network use. More people make telephone calls than use the Internet in part because more people own phones (approximately 93% of households) than modem equipped computers (variously estimated to be 25% of households). In contrast, transmission, particularly in a digital world, is relatively indifferent to the application since, during transmission, "bits are bits." Therefore, the distribution of access technologies strongly influences who participates in society and in which roles.

The distribution of network access technologies is seldom discussed. They are products of a competitive marketplace. It is presumed that households and businesses will acquire them according to their needs.

There are a few problems with this presumption. Needs can quickly overwhelm budget -- undercapitalized organizations such as local governments, non-profits and small businesses can seldom afford the technology they need.

In many cases, technology needs are difficult to identify because the applications involve new strategies, and/or the new capabilities need to be experienced to be understood. Because of their high cost and the infrequency of need by any given individual or company, some access technologies are best suited to shared-use rather than private-use. A device for remote fetal monitoring of pregnant women is an example.

Network access technologies can be organized into large families of hardware, software, furniture and space that are intertwined in the consumer's application. The families of access technology include:

- home/office-small office (SOHO)
- entertainment
- audio production
- video production
- medical
- education/training

State-of-the-art can cost over $100,000 for some families of access technologies. No single household, no matter how wealthy, will maintain a state-of-the-art infrastructure for even one of these families.

Network Access Centers

A network access center (NAC) consists of one or more families of access technologies connected to broadband network service. The purpose is to offer a robust array of network access opportunities at non-commercial rates. Commercial access can exist alongside the non-commercial in the same way that a book store might locate adjacent to a public library.

The NAC can offer public access to basic computing and communications. As importantly, the infrastructure can also be used to import a mix of urban functions to the NAC which satisfies the travel needs of the local community. Distance education, telemedicine, electronic government, and e-commerce are broad categories of options.

Because of these capabilities, a system of NACs can contribute to the two chronic challenges mentioned at the top of this paper – mobility and economic development.

Mobility

Network access centers make it possible to quickly and affordably re-locate a number of normal trip destinations to residential areas, rail stations and other major transit stops. This would bring economic opportunities, business services, educational opportunities, government services and retail shopping to within walking distance of residential concentrations and bus or rail transit – all without the need for extensive physical construction of new buildings.

This is possible because:

- The urban form of most cities feature functions that are widely separated spatially;

- Travel occurs when people need to pursue another function (go to work, go to school, go to the doctor, shop);

- Many functions can be separated from their traditional physical location in a building and re-located to a network; and

- The spatial re-organization of urban functions can be accomplished by creating multiple points of network access.

Re-locating a function normally found at a particular geographic location to a network is exactly what happens in the following cases, all of which happen today.

- consumers satisfy some of their banking needs at an ATM,
- students take a distance education class at an off-campus location,
- citizens pay their traffic tickets at a government kiosk,
- employees work at a telework station near home,
- business people hold meetings over an audio bridge,
- work teams complete their collaborative assignments using e-mail, and
- consumers buy clothes over the Internet.

This means by clustering the technologies required to access the network, many urban functions can be spatially reorganized into new patterns that are conducive to public transit usage and walking. This strategy will attract complementary commercial services, impact the immediately adjacent real estate, and stimulate the market for network technologies.

Economic Development

A system of public network access centers can introduce economic activity at locations where it is currently absent (such as a shopping mall with high vacancies and turnover, or abandoned buildings at a public transit stop) or enhance economic activity at already

successful locations. In general, a system of NACs will provide every community with universal access to the means of production in an information economy. It will also specifically provide:

- Access points to electronic commerce – access to the Internet could become 100% within 5 years under this arrangement, thereby serving to increase e-commerce.

- A linked material-economy marketplace – books sold on-site to those attending a video conference of an author's reading – opportunities for such linkages are virtually endless.

- A public facility with "spread effects" for the adjacent real estate – network access simulates "compact development," creates demand for complementary activities such as food service, and generally increases foot traffic.

- 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 – many important local organizations are so poorly capitalized that they are using 486 chip computers when a Pentium III is available.

- A place for diffusion of new technologies that will stimulate the market for network technologies such as the latest scanner or software release; as well as programmatic innovations that will help create and sustain the e-culture such as the Comptroller of the Currency introducing electronic funds transfer to low income populations.

The non-commercial network transmission and access facilities together will constitute what could be called the *public transit system on the information superhighway*.

Other Technology Strategies

The *bricks and bits* retrofit strategy is unique in that it uses broadband networks to spatially re-organize urban functions. However, a network access center is often confused with the products of other technology-based strategies.

Community Technology Centers

Centers such as Break Away Technologies and the Puente Learning Center in the Los Angeles area, Playing To Win on the east coast, and Plugged In in Silicon Valley are a few examples of Community Technology Centers (CTC). CTCs are valuable additions to any community, particularly those with low incomes -- but they are not network access centers.

In practice, four dimensions in particular distinguish a NAC from a CTC. The first is the conscious attempt in a NAC to offer a very wide array of urban functions. For example, CTCs don't tend to offer distance education from a variety of educational institutions. They do not offer the opportunity for a visitor to pay a parking ticket, meet with a Social Security Administration benefits counselor, or meet with a business mentor.

Second, CTCs are not consciously developed adjacent to major public transportation intersections.

Third, CTCs usually are found in stand-alone facilities whereas a NAC is at the core of an integrated mix of not only the technologies and non-profit access of a CTC, but also an array of for-profit, not-for-profit, and government facilities (this array is referred to as a TeleVillage – see below).

Fourth, CTCs are not always common carriers but may be sponsored by membership organizations such as churches where users are required to consume the organization's content programs in order to gain access to the technology.

On-Line Communities

Project sponsors as diverse as the National Telecommunications and Information Administration (NTIA -- through its Telecommunications Infrastructure Improvement Assistance Program) and Caltrans have supported the formation of city-based on-line communities. The Davis Community Network, Net at Three Rivers and the Smart Communities initiative are examples.

While these are also valuable developments, they do not appear to have a direct linkage to mobility or universal service. And the bricks part of the equation are usually missing. The economic development linkages for on-line communities are still being identified.

Telework Centers

Telework centers (also known as telebusiness centers, or telecenters) were initially developed strictly as a mobility strategy for office-based information workers. Over $10 million in the Southern California region alone was invested by public air quality and transportation agencies in the early 1990s. Such centers generally failed to meet their goals for a variety of reasons that include incorrect location, wrong size (too small), wrong product mix (not enough private offices, no value-added business services), lack of an effective marketing program, and poor management. In general, revenues were insufficient to continue the operation beyond the period of public subsidy. Only a couple of such centers, each with unique characteristics, continue to function.

TeleVillage Center

A TeleVillage Center is a particular kind of real estate development in that it uses *bricks and bits* to provide all the functionality of a traditional village center. Some functions are available through bricks and mortar buildings and others are available over the network. This gives the development the quality of being super compact – offering much greater functional density than can be achieved through bricks and mortar alone.

The *bricks and bits* strategy calls for a region-wide system of network access centers. Some will be larger at the village scale and others smaller for neighborhoods. The TeleVillage Center will eventually become the main activity center for its service area. A variety of transportation innovations will be introduced in order to reduce the dependence of cities on the single occupant fossil fueled vehicle.

A single prototype TeleVillage Center was developed by the Los Angeles County MTA between 1995 and 1997. This project was a very modest demonstration of the *bricks and bits* concept. The primary achievement was showing that a low-income community could be engaged to work with the County transportation authority in order to design and implement a technological innovation that was foreign to both groups. The results of the first year's operation are described next.

Case Study: Blue Line TeleVillage

The Community

The Blue Line TeleVillage is located adjacent to the Metro Blue Line (a 22 mile light rail system that connects the central business districts of Los Angeles and Long Beach) at the Martin Luther King, Jr. Transit Center in the City of Compton. The TeleVillage used about 2,500 square feet of space in the city-owned Transit Center. The site was chosen primarily because space was immediately available in a suitable facility adjacent to a rail station at about the mid-point on the Metro Blue Line.

According to the Los Angeles County Metropolitan Transportation Authority (MTA), there are approximately 6,000 weekday boardings and alightings at the MLK Transit Center. 43% of these are Blue Line riders and 57% are bus riders (the Transit Center is a transfer point for six MTA lines). The site is also the location of a regional Greyhound terminus.

The Transit Center also contained the Compton Chamber of Commerce, a Compton Police sub-station, a day care center, a Head Start Program, a beauty shop, a sandwich shop, and the City of Compton's Business Assistance Center. A suburban style shopping center and the Compton Civic Center, which itself included the police station, City Hall,

Post Office, and County Court House were within approximately 1/4 mile of the Transit Center. Large vacant lots are directly adjacent and within 1/4 mile.

Just under 10,000 people lived within 1/2 mile of the facility – the outer limit of walking distance. There were 41,600 people living within 1 mile and 133,700 within 2 miles of the facility. There were 121 business establishments with about 4,000 employees within a half-mile radius.

The service area has been undergoing a transition from African American to Hispanic origin with the current population at about 50% each. Compton is a suburban community with housing throughout the service area less dense than in the County as a whole.

In general, census data indicate that the area immediately surrounding the Transit Center and the TeleVillage evidences characteristics that pose significant challenges (and opportunities) to the development of a telecommunications-based community center. Both the 1-mile radius service area and the 2-mile radius[1] service area are composed of residents younger than the national average and with incomes and levels of education below the national average. Residents living within 1 mile of the site also have an above-average share of households without a vehicle.

The following provides a more concrete picture of the service area:

	Total Pop.	**Hispanic Pop.**	**Income Per cap.**	**Hhold Avg. Inc.**	**% w/out diploma***	**% un-employed**	**% blue collar**
1-mile	41,598	25,333	$8,237	$34,691	53%	15.2%	65.8%
2-mile	133,740	79,040	$8,819	$37,271	51.2%	14.1%	62.6%
LA County	9,369,800	3,351,242	$23,501	$56,870	30%	8.2%	40.1%

* For the population over the age of 25

Source for 1-mile and 2-mile radius: Claritas Data Services, 1997
Source for L.A. County: California Dept. of Finance, 1997

Census data also indicate that, despite lower socio-economic indicators, the potential business market for services within a 2-mile radius of the Transit Center is sizable. There exists a pool of over 12,000 government workers; 25,000 manufacturing employees in over 450 different establishments; and 7,800 retail trade employees in some 480 establishments.

Project Design

The MTA funded TeleVillage planning, development, and a 12 month operational period based on a model provided by Siembab Planning Associates in a 1992 policy report

[1] Population figures are from 1996 UDS Estimates. Income figures are from the 1990 Census.

entitled “Metro Net.” The facility deploys a range of off-the-shelf network technologies and provides access to broadband network services. Funding from the MTA required that mobility objectives be the priority.

The project cost $659,000, and was paid for by a $559,000 grant from the 1993-94 Transportation Improvement Program or TIP (involving the Intermodal Surface Transportation Efficiency Act and Congestion Management and Air Quality funds with the local match from a County sales tax – “Proposition C”). The Federal Transit Administration provided a supplemental grant of $100,000. The MTA was the project manager, Drew Economic Development Corporation the prime contractor and Siembab Planning Associates provided design, planning and development expertise.

From the original TIP grant, $288,995 was used for planning, development and implementation; $99,700 to operate the facility during the 12 month demonstration period which began March 1, 1996 and continued until February 28, 1997; equipment was leased for $42,200, site improvements cost $82,000, furniture was $14,700, space lease paid to the City of Compton was $18,700, and the community planning meeting cost $8,800 (including catering for 150 community leaders and travel expense to bring in expert presenters).

The $100,000 FTA grant was used to support marketing ($13,200), training community leaders in the possibilities of the facility ($12,000), data collection ($12,000), supplementary operations ($46,800), and project management ($16,000).

The BLTV had six elements.

Computer Center – in an 800 square foot room equipped with 12 pentium computers on a local area network. Internet access was provided using 4 integrated services digital network (ISDN) lines.

The computer center provided public access computing, classes ranging from an introduction to computers to intermediate courses in several applications programs, internet access, contract training for local organizations such as day care providers, and facility rental to large organizations interested in conducting their own computer training programs for employees.

Video Conference Center – in a 1200 square foot room equipped with a dual monitor group-scale video conference system, seating for up to 25 people, and three ISDN lines with an option for three additional lines.

24 interactive video conferences were held during the demonstration year in addition to 50 meetings that did not use technology. The video conferences included a contract distance education class on use of technology in the workplace originating at California State University at Dominguez Hills; library services such as story telling for pre-school children and a book tour lecture by African American author Walter Mosley originating

in the Pasadena Public Library; several small business assistance seminars sponsored by LA County's Small Business Development Center also originating in the Pasadena Public Library; a meeting demonstrating the technology for local artists, and another with an FTA official discussing possible programs with state and federal agencies.

Telework Center – two semi-private work stations equipped with computers, telephones and printer, connected to the internet through the local area network in the Computer Center. The Telework Center was located in the City of Compton's Business Assistance Center (BAC) and provided teleworkers with access to the BAC's meeting room and library. The library was also equipped with a VCR and a desk-top video conferencing unit using a single ISDN line.

The telework center provided a professional work space for local residents who were home-based or for small and under-capitalized organizations; and provided a remote work station for employees telecommuting from a regular job. The desk-top video conferencing unit was intended for local business people to obtain one-on-one training from mentors in Small Business Development Centers located elsewhere in the County.

Kiosks – City of Los Angeles Housing Authority Kiosk providing access to information on employment opportunities and waiting lists for affordable housing, AIDS Information Center of the County Museum of Science and Industry, an ATM from Wells Fargo Bank, and an ATM from the Bank of America. A California Department of Transportation (Caltrans) Smart Traveler kiosk arrived too late for inclusion in the demonstration year.

Community Meeting Room -- a large space that could seat up to several hundred participants.

The room was used for several large gatherings sponsored by the MTA or the BLTV, including the community leaders planning meeting, Advisory Board meetings and a "Women's Day" Conference. In addition, other organizations held meetings there in order to tour or to use some other element of the BLTV. These included the Inner City Computer Society, the Compton Chamber of Commerce and the Regional Business Assistance Network of the Los Angeles Economic Development Corporation.

Circuit Rider Work Station – set aside so that representatives of various government agencies could appear for scheduled visits at the BLTV to provide information or directly deliver services to constituents. Examples might include a benefits counselor from the Social Security Administration. However, only the federal Office of Personnel Management and the MTA provided a circuit rider, although there was community interest in other government agencies. The work station was primarily used for BLTV administration.

Findings

The Blue Line TeleVillage began with a site selection study and a community-based planning process. This led to the design for the facility, site improvements, development of applications, and one year of operations. While a great deal was learned from this project, the results are far from conclusive. Nevertheless, the results are promising in that they suggest the validity of the *bricks and bits* retrofit strategy.

The findings discussed below briefly address the initial contributions to mobility and economic development. A third area – institutional renewal – is also discussed because it is ultimately the area that must develop if the bricks and bits strategy will succeed. The complete documentation is in the Final Report, available from the MTA

Economic Development

The following summarizes the contribution of the network access center to economic development.

- Almost 2,000 people received training in computer skills. The TeleVillage was not merely a place to access the network, but also the skills needed to make the most of the network. In this sense the TeleVillage functioned as a school, expanding upon the limited number of training centers present in the community. There were 660 paying members at the end of the demonstration period. The TeleVillage currently has close to 2,500 members.

- Expansion of business opportunities was the community's expressed priority, and almost 22% of the applications implemented involved business support. In one key example of the marriage of bricks-and-bits, Compton's Business Assistance Center used video conferencing to "bring in" business development specialists, including representatives from the County's Small Business Development Centers, who do not normally include Compton in their service area.

- Linkage of the local material economy to the cyber economy was demonstrated.

The BLTV also capitalized the community by providing access to technology:

- There were over 6,000 visits to the BLTV, almost all of them to use technology in some form. The kiosks were extensively used.

- Network transmission services and technologies to access the network were available at far below market rates.

- Virtually all the local participating organizations were relatively small and under-capitalized and they gained access to resources through the BLTV that would have otherwise been unavailable.

Mobility

The consulting team assembled base line data for the project. Among these data were a comparison of mode choices by County and BLTV Service Area residents for their journey to work (from the 1990 Census), and by members and a core group of on-site visitors for their journey to the BLTV.

Mode Choice for Journey to Work and Journey to the BLTV

	To Work		To BLTV	
	County	**Service Area** 2 mi rad	**Member Data Base** N=620	**Core User Survey** N=34
Auto	85.6%	88.3%	70.8%	45.4%
Transit	6.5	6.2	20.2	44.1
Walk	3.3	2.4	9.0	10.3

While comparison of these data is problematic, the result is consistent with the prediction that compact development would be characterized by less automobile use and more transit use and walking. In other words, a transit stop that is walking distance from a variety of possible destinations should generally enjoy an automobile-light mode split.

The BLTV data were collected from those specific people who came to the transit center either to access urban functions mediated by the network (such as a business assistance seminar) or to get training on- and access to- some element of the network itself. For most of them, the BLTV was their destination.

Formal research is needed to clarify the relationship between a TeleVillage and transportation mode choice. Other transit options such as bicycle stations, station cars, and short-range flexible services should be introduced to the BLTV, and many more urban functions should be added as part of that research effort.

Institutional Renewal

A “Participation Ladder” was defined in order to gauge the progress made in finding or encouraging public, private and non-profit organizations to shift some functionality to the network.

Among the lessons learned from the demonstration project were that all levels of government and most non-profits, despite the international rhetoric about the information superhighway, lag behind the private sector in network applications.

Overall, the project contacted over 289 organizations in order to get the 32 who actually conducted an application through the BLTV. This was almost a 10 to 1 ratio.

Those organizations that were able to quickly migrate some of their functions to a network were satisfied by the experience. The best example was by the Small Business Development Centers, one element of the County's business development strategy.

For example, SBDC management realized through their participation at the BLTV that each seminar could reach a larger audience per presentation through interactive video conferencing with no drop-off in quality. This would allow, in the near term, presenters to develop specialization in, for example, planning for import-export as opposed to repeating the same basic business planning seminar. Service quality could increase with no additional costs.

Conclusions and Recommendations

The results of the Blue Line TeleVillage indicate that, within the first year, a network access center can provide economic resources to a low income community and contribute to an apparent mode shift toward public transit and walking, even without special programs to encourage non-motorized alternatives.

The most surprising result is the apparent slow pace at which functionality is being transferred from buildings to networks. This pace is manifest in the lack of "shelf-ready" partners (i.e., those organizations that have or are adopting their own e-culture), and in the resistance of target organizations to take the first steps in that direction. In general, government agencies were not strong candidates for participation in the short run.

This suggests that local governments who are committed to improving mobility without large transportation infrastructure investments, and to adopting economic development programs that do not repeat previous experiences, can move toward those goals through their own corporate powers.

Local Government Steps

In the past, it was government's police powers that formed the primary vehicle for government participation in telecommunications – from local cable franchising authority to state common carrier regulation. Today it is the corporate powers with the most importance. These include:

- Real estate utilization policies
- Employee work rules and work options
- Network utilization practices and management policies
- Joint development policies
- Redevelopment investment policies
- Transportation capital investment priorities

- Public transit services

Next steps are, accordingly, expressed in terms of these categories. Here are a few examples:

- Critically evaluate the costs and uses of city hall, county building, libraries, recreation centers and so forth in terms of the functions that each produces, and the options for migrating some of those functions onto a network. Network access can also make some of these functions available 24 hours a day in a choice of languages.

- Institute alternate officing policies whereby a mix of remote work options including home, telework center, or other government office complements some form of "hotelling" in the central facility.

- Invest in audio conference equipment (bridge and speaker phones) and form relationships with video conference providers in order for government staff members to reduce their "for-work" travel by conducting more of their government business electronically.

- As functionality gets shifted from a central office place to remote office place or a network space, introduce new functions to the vacated places. For example, a portion of city hall could be used to house other government representatives and services, public meeting space, distance education classes, or even telemedicine services.

- Consider network access centers as a key element of redevelopment plans or of downtown revitalization efforts. Become an anchor client of the telework center in the NAC by committing employees who live within each NAC's catchment area to the telework center one or two days a week.

- Develop strategic alliances with school systems, transportation authorities and private developers to create a system of NACs within the city and county. In particular, look for opportunities to pool rights-of-way that can be marketed as a consortium to private network developers.

There are many ways for local governments to use the digital broadband network to meet its goals. This new, powerful technology should not be left solely for the private sector to exploit for private gain. The public interest has needs that can and should be addressed through the strategic application of these technologies. The *bricks and bits* strategy shows promise for realizing those benefits.

Walter Siembab is President of Siembab Planning Associates. The firm specializes in planning and implementing telecommunications strategies for urban and regional development. Mr. Siembab is also author of the Metro Net policy study for the Los Angeles County Metropolitan Transportation Authority, and principal designer of the

Blue Line TeleVillage. Thomas O'Brien is Vice President of Siembab Planning Associates and was Assistant Project Manager for the Blue Line TeleVillage Demonstration.