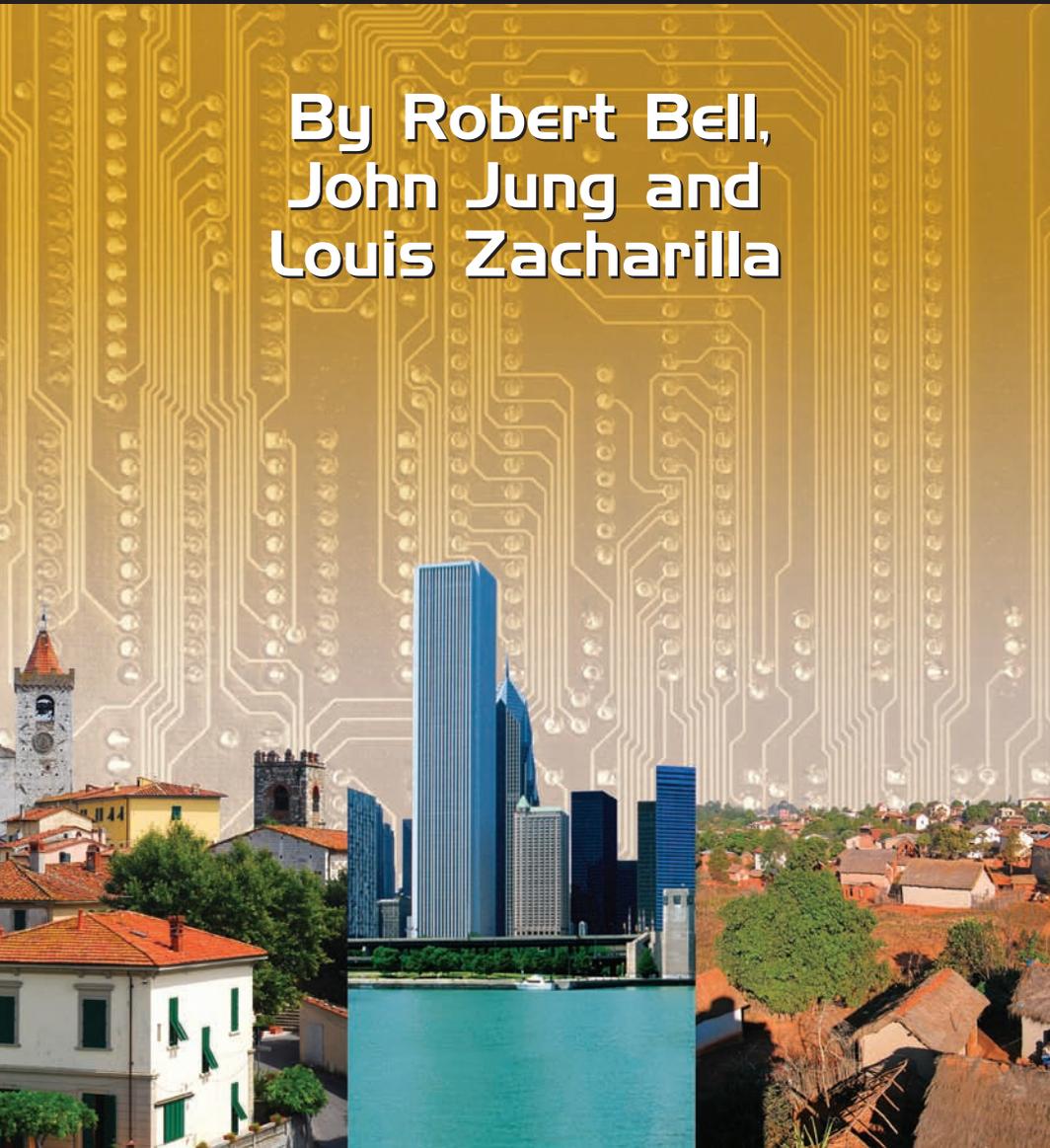


BROADBAND ECONOMIES

CREATING THE COMMUNITY OF THE 21ST CENTURY

By Robert Bell,
John Jung and
Louis Zacharilla



Broadband Connectivity

The development of telecommunications has followed different paths in different places, but the stories have much in common. At their heart is tension between telecommunications as a business and telecommunications as a public good – between the profit motive and a public-service mandate.

Typically, development begins as a business venture. Investors become convinced of the potential of a new system, and businesses develop and deploy it. As the business model proves itself, more investment rushes in, focused on the most profitable markets and often sacrificing quality of service in a rush to gain market share. At some point, often as providers teeter on the edge of bankruptcy, government steps in, either to make rules governing access and quality for what has become a broadly-used public service, or to acquire the assets and run the telecommunications infrastructure itself.

In much of the world, national governments became the telecommunications operators through state-owned companies such as France Telecom, Nippon Telegraph & Telephone, Embratel and Telekom South Africa. In the US, development took a different course, largely through the efforts of Theodore Vail, the first president of AT&T, who convinced state regulators that the public would benefit more from having a privately-held monopoly provider buy up floundering local telephone companies and guarantee a high level of service at an affordable price.

Since the 1980s, there has been an overwhelming global move in the opposite direction: to eliminate monopolies and sell off state-owned telephone companies. Early competitive providers like MCI in the US pointed the way by demonstrating that competition could drastically lower long-distance tele-

phone costs and provide a more innovative range of services. When governed by transparent and impartial regulations to protect the public interest, competition appears to deliver the best value to customers and the best growth environment for the industry as a whole – if not for incumbents that formerly benefited from a stranglehold on the market.

The Broadband Race

Communications carriers around the globe have moved to deploy broadband – via xDSL, cable modem and wireless – to consumers, small businesses and institutions in the most profitable markets. The rate of deployment has varied drastically from nation to nation. The Organization for Economic Cooperation and Development, a membership organization for the world's industrial economies, provides a portal reporting on broadband penetration, services and speeds. Its June 2007 report showed the following breakdown of broadband penetration per 100 people in the 30 OECD member countries:

OECD Broadband statistics

OECD Broadband subscribers per 100 inhabitants, June 2007

Rank		DSL	Cable	Fiber	Other	Total
1	Denmark	21.3	9.7	2.9	0.4	34.3
2	Netherlands	20.4	12.7	0.4	0.0	33.5
3	Switzerland	20.5	9.3	0.0	0.9	30.7
4	Korea	10.1	10.6	9.2	0.0	29.9
5	Norway	22.7	4.5	1.8	0.7	29.8
6	Iceland	29.0	0.0	0.2	0.6	29.8
7	Finland	24.4	3.7	0.0	0.8	28.8
8	Sweden	17.9	5.6	4.6	0.4	28.6
9	Canada	11.9	12.9	0.0	0.1	25.0
10	Belgium	14.5	9.2	0.0	0.1	23.8
11	UK	18.4	5.3	0.0	0.0	23.7
12	Australia	18.3	3.4	0.0	0.9	22.7
13	France	21.4	1.1	0.0	0.0	22.5
14	Luxembourg	19.8	2.4	0.0	0.0	22.2
15	United States	9.3	11.5	0.6	0.7	22.1
16	Japan	10.8	2.9	7.6	0.0	21.3

Rank		DSL	Cable	Fiber	Other	Total
17	Germany	20.2	1.0	0.0	0.1	21.2
18	Austria	11.4	6.6	0.0	0.6	18.6
19	Spain	13.3	3.6	0.0	0.1	17.0
20	New Zealand	14.6	1.1	0.0	0.8	16.5
21	Italy	15.4	0.0	0.4	0.0	15.8
22	Ireland	11.1	1.6	0.0	2.6	15.4
23	Portugal	9.2	5.4	0.0	0.1	14.7
24	Czech Rep.	5.5	2.5	0.3	3.9	12.2
25	Hungary	6.8	4.7	0.0	0.1	11.6
26	Poland	5.5	2.4	0.0	0.1	8.0
27	Greece	7.1	0.0	0.0	0.0	7.1
28	Slovak Rep.	3.9	0.8	1.1	1.0	6.8
29	Turkey	5.1	0.0	0.0	0.0	5.2
30	Mexico	3.5	1.0	0.0	0.1	4.6
	OECD	11.6	5.4	1.4	0.3	18.8

Figure 4

The annual publication of this list causes much hand-wringing in the nations, from the US to Germany, that appear lower on the list than they would like. Recent work from The Phoenix Center for Advanced Legal & Economic Public Policy Studies (www.phoenix-center.org) suggests, however, that as much of 90% of the variance is caused by factors including geography, educational achievement, social attitudes and culture that are beyond the reach of simple policy fixes. And despite concern over the “slow” pace of deployment, broadband has been one of the fastest-growing technologies in telecommunications history. According to a 2004 report by the UK-based research group PointTopic, it took mobile phones 5.5 years to grow from 10 million to 100 million subscribers worldwide. Broadband did it in 3.5 years.⁵

Nonetheless, as the economic potential of information and communications technology has become clear, broadband deployment has become an important local and regional issue. Local, state and provincial governments strive to ensure that their citizens and businesses have what it takes to succeed in an increasingly competitive global economy. The result is a

revival of tensions between public and private sectors about building networks and deploying services.

Next-Gen Communications

Much of this book is devoted to broadband: its use, its challenges and its transformative impact on communities. But there is actually nothing important about broadband in and of itself. What *is* important is that, in industrialized nations, broadband represents the next generation in communications.

Before the Internet, one-to-one communications for most of us meant voice, either fixed line or mobile, with data and video transmission reserved for organizations that could afford its high cost. The arrival of the Web made both browsing Web sites and email – the killer app of the Internet – accessible to anyone who could afford a personal computer and a dial-up Internet connection. With broadband, the merger of computers and communications goes one step further. A broadband-enabled computer has access to virtually unlimited digital resources: information in text, graphic, audio and video formats, downloadable software, hosted services, real-time communications through instant messaging – the list goes on and on. In the days when dial-up was most people's only access to the Internet, there was a clear dividing line between software and files that resided on your own PC and those out on the Web. Minutes elapsed from the time of a mouse-click requesting something to its delivery. With a broadband connection, however, the distinction between your own PC and the Web blurs. The relatively cheap computer on your desk or lap reaches seamlessly in seconds around the globe.

In industrialized nations, there is a rising tide of argument in favor of fiber-to-the-home deployment providing speeds of 20-100 Mbps to residential users. Proponents believe that xDSL and cable broadband, which are still being deployed, will turn out to be a dead end because they will not support the emerging era of Web 2.0, video and rich-media applications.

Rather than allowing another bottleneck to form, the argument goes, it is better to deploy the essentially unlimited capacity of fiber now.

But the transformative impact of communications is not just about broadband. In 2007 in the United Kingdom, there were 66 Internet users per 100 people and 25 of them were on broadband. In Kenya, there were only 8 Internet users per 100 and only half of one percent was on broadband. But there

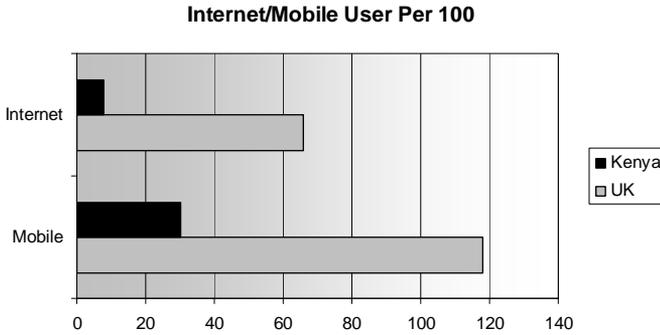


Figure 5

were 30 Kenyan telephone subscribers per 100 people that year, compared with 118 in the UK. Put another way, a Brit in 2007 may have been 500 times more likely to be on broadband than a Kenyan, but only 4 times more likely to have a mobile phone.⁶

Access to mobile telephony has skyrocketed in Africa, from 37 million subscribers in 2002 to 270 million in 2007, a 48% compound annual growth rate. Nearly 90% of all phone lines in Kenya were mobile in 2007, compared with 68% in the UK and only 57% in the USA.⁷ And it has had the same transformative impact for people who did not previously have a telephone as access to broadband has had in richer nations. The largest mobile carrier in Kenya, Safaricom, has seen its subscriber base rise from 20,000 in 2000 to over 10 million in 2008. One of its most enduring achievements may be M-PESA, a pioneering service that enables Safaricom's custom-

ers to send money to each other by text message faster and cheaper than by conventional funds transfer. In 2008, it was moving US\$1.5 million per day across Kenya, and the company had begun rolling the service out in India, Tanzania, Afghanistan and other markets.⁸ The ability to send money by phone has multiple impacts. Day laborers can be paid by phone, as can taxi drivers, who thereby avoid carrying lots of cash around. Money can be sent to friends and family in emergencies. One popular practice is to deposit money before making a long journey and then withdraw it at the other end, which is safer than carrying lots of cash. For Safaricom's customers, M-PESA effectively lowers the barriers to trade, which has been as beneficial at the local level as it is on the international level.⁹

An August 2007 paper by Robert Jensen reported on what economists call a “natural experiment” that took place in Kerala, India between 1997 and 2006. The fishermen of Kerala, a region in the south of India, faced the usual problems of their trade in developing nations. With no information on prices being paid at different markets, they typically took their fish to the same local market. If that market was oversupplied, they might earn nothing for their catch. But traveling hours to another market with a highly perishable cargo was out of the question. In his study, Dr. Jensen was able to show that, on average, 5-8% of the total catch was wasted, and there were wide variations in the price of fish at the 15 beach markets he studied along the coast. But in 1997, mobile phones came to Kerala and fishermen began to use them to check on local markets while they were still at sea. The coverage spread gradually, giving Dr. Jensen the chance to study the impact on the fishermen's behavior, the price of fish and the amount of waste. What he found was that, as soon as coverage became available in a region, the percentage of fishermen who ventured beyond their local market rose from zero to 35%. At that point, no fish were wasted and the variation in price between markets dropped dramatically. This more efficient

market benefited everyone. Fishermen's profits rose 8% on average and consumer prices fell by 4% on average. Higher profits meant the phones typically paid for themselves within two months. And the benefits seemed to endure over time.¹⁰

Mobile Phones Transform African Fishing

Before fishermen had access to mobile:

- 0% of fishermen sold outside their "home" market
- 5-8% of the total catch went to waste

After fishermen gained access to mobile:

- 35% of fishermen sold outside their "home" market
 - 0% of total catch went to waste
 - Consumer prices fell 4%
 - Fishermen's profits rose 8%
-

In a separate study in 2005, Leonard Waverman of the London Business School found that an extra 10 mobile phones per 100 people (10% growth) in a typical developing nation leads to an additional 0.59 percentage points of growth in GDP per person.¹¹

Though we will go on talking about broadband in the rest of this chapter, keep one thing in mind. The ways in which communities obtain broadband, promote its use and create digital cultures of use apply to any kind of next-gen communications. The tactics of implementation will vary depending on the technology, the level of development of the local economy and the culture of its people. But the basic strategies apply as well in the developing world as the industrial nations.

Why Government Gets Involved

Why do local, state or provincial governments get involved in bringing connectivity to their communities? There appear to be three reasons:

1. **The Connectivity Gap.** Broadband becomes a political and governance issue in communities that believe they suffer from a lack of affordable, high-quality access. The broadband gap may take several forms:

- “Market failure,” in which private-sector providers have not deployed broadband to a majority of the population (or at all)
- Pricing that makes broadband unaffordable to some or most citizens
- Quality of service that is judged inadequate, whether due to slow speeds, service interruptions or other factors

Of the three areas of concern, market failure is generally the easiest to demonstrate objectively. If private-sector carriers have not deployed broadband at all, or deployed only down Main Street, there is clearly a lack of appetite to invest. Pricing and quality of service are more reflective of the expectations of the community.

2. **Connectivity “Holes.”** Even in communities with ample broadband resources, there are often locations that go unwired. They may be old industrial zones, low-income neighborhoods, or areas that pose a geographic challenge to network developers.

3. **Connectivity Promotion.** Sometimes communities want to invest in broadband in order to make a statement. They may choose to wire (or “unwire”) the local airport, central business district, parks or other zones as a marketing or business development effort. They are sending a message that their community “gets it” when it comes to the Broadband Economy.

The reasons are listed in order of decreasing political sensitivity. Connectivity promotion projects are by far the most common, because they are relatively easy. They involve a restricted area, frequently use government-owned assets such as light poles for deployment, and have a low and predictable cost. For these reasons, they involve little competition with the private sector. Identifying and filling connectivity holes brings the government into direct competition with private carriers, albeit in niche geographic markets in which the carriers have demonstrated little interest. And in seeking to address an overall connectivity gap, government sets up as a decision-maker concerning issues left to the market in most industrialized economies: where and when to invest, what price to charge, and what quality of service to provide for that price.

Local and regional governments have found many ways to involve themselves in spurring access to broadband for their constituents. The most successful have all begun with the same first step: establishing a clear vision and communicating why broadband access matters. Though broadband has been a wildly successful commercial service, it is still not as common or well understood as traditional infrastructure. If constituents believe that broadband is just about online music or games, they will not provide political support when it is needed. And if communities choose to invest public funds, they need detailed plans with well-defined goals and milestones.

Once communities know what they want to do and why, they typically follow one of five different strategies. The following are the strategies, with examples from the communities that have followed them.

1. Development Policy

Remaining safely within the bounds of traditional policy-making, governments direct the usual tools of development policy at broadband deployment. They offer tax credits and,

craft rights-of-way policies to support network development (including laying conduit whenever they excavate streets. They conduct inventories of existing broadband networks and access points, and launch feasibility studies into building government-owned networks – at least partly in order to convince the private-sector that they mean business.

In **Loma Linda, California, USA^a**, city government created a Connected Community project that envisioned every building connected with a 10 Gbps network. As part of implementation, it created what it called The Loma Linda Standard for all new residential and commercial construction as well as remodeling affecting more than 50% of a structure. The standard defined how internal cabling, the “wiring closet,” the demarcation and external conduit networks were to be constructed to ensure that every resident or tenant of every building had the potential to access high-speed broadband services. The standard created a “bias toward broadband” among developers that proved transformative for the community. From 2004 to 2007, nearly a dozen projects went into development that incorporated the Loma Linda Standard.

Loma Linda, California, USA

- Loma Linda Standard made all new and +49% retrofit residential and business construction “broadband ready”

Whittlesea, Victoria, Australia

- WIRED Development project required developers of subdivisions to install conduit and grant ownership to city
- City agreed to lease conduit at attractive rates to carriers for FTTP deployment

The city of **Whittlesea, Victoria, Australia^b** also seized the opportunity created by property development to set standards for a broadband future. Through a project it called WIRED Development, it changed local planning rules to

^a 2007 Smart21 Community

^b 2007 Smart21 Community

require developers to install conduit as part of sub-division development and to turn ownership over to the city. Technical specifications for the conduit were included in the new rules. As part of the deal, the city agreed to lease the conduit at very attractive rates to carriers for the installation of a fiber-to-the-home network and delivery of “triple play” services. In 2005, the first developer to apply the rules issued a tender covering an 8,000-home development.

2. Networks for Government

Local and regional governments are big users of communications services, and they are generally as free as any business to build private networks for their own use. They construct a fiber, wireless or coaxial network linking all government offices, schools, libraries, hospitals and other public facilities in order to reduce communication costs and gain new capabilities. Fears of terrorism have spurred many national governments to make funds available to communities to improve “first responder” communications, and communities have been quick to capitalize on this opportunity. They deploy wireless networks, using the fiber/coax network as a backbone, to extend network applications to police, fire and emergency medical service vehicles as well. Having built out this sophisticated network, such communities often match the hardware investment with investments in e-government applications that further reduce costs while improving service to constituents.

What does this activity have to do with improving public access to broadband? By making these investments in networks and services, government becomes a vital anchor tenant for broadband and stimulates demand for broadband services. Public investment will frequently attract carriers interested in building and managing the network under a managed service contract – and it can be a short step from there to deploying

services to constituents as well. Successful e-government programs increase overall broadband demand, further enhancing the opportunities for the private sector.

The city of **Corpus Christi, Texas, USA**^a installed a WiFi network in 2004 to automate the reading of utility meters for its municipal-owned utilities, saving substantial money and improving the accuracy of billing data. Once the network had proved itself in a pilot project, however, the city enlisted all of its departments to study current business practices and identify possible improvements and cost/time savings that could be gained by moving to all-electronic processes. After identifying and prioritizing over 80 potential business process improvements, the city decided to install a network covering the entire municipality. County, state, federal and independent agencies were invited to share the network to communicate with assets in the coverage area. Local colleges were enlisted to partner with local businesses to upgrade their information technology systems and find ways to use the network for communication, Web access, dispatch, fleet location, inventory control and Internet marketing. The Corpus Christi school district issued wireless laptops to students in disadvantaged areas with virtual textbooks, Internet connectivity, parent-teacher communications, lessons plans and other educational resource access. The local bus company even installed Internet service on buses serving express routes to entice commuters.

Corpus Christi, Texas, USA

- 2004 WiFi network, deployed to automate utility meter reading, saved money and increased accuracy
- Business process improvement project identified 80 additional opportunities for savings and provided business case for network expansion and upgrade
- Applications expanded on network backbone: universities helping local businesses upgrade IT, wireless laptop program for students, WiFi on the move for bus system

^a 2007 Smart21 Community

Kabul, Afghanistan

- Government Communications Network linked ministries, provincial capitals and legislative districts
- Played essential role in the nation's first democratic election
- Adapted to connect isolated mobile phone switches, creating first modern communications network

Kabul, Afghanistan^a is the unlikely location of another such government network project. Using funds from development agencies and the US government, this war-torn capital of Afghanistan has built a telecom-based foundation for government. It developed an IP-based Government Communications Network linking 42 ministries and offices in Kabul via optical fiber and microwave, and extended this core network to 34 provincial capitals via satellite. A District Communications Network pushed connectivity further out to Afghanistan's 337 legislative districts. Both networks were essential to conducting Afghanistan's first democratic election. But they also became the foundation for a telecom revolution. Mobile phone service in Afghanistan was limited to disconnected “islands” where people could place local calls but not connect to the outside world. Once the network was in place, the contractor turned it into a backbone for connecting the mobile switches scattered around the country, introducing the first modern communications service much of the country had ever known. Not surprisingly, communications traffic soared as the long pent-up demand found an outlet.

3. Public-Private Partnerships

In other cases, government sets its sights on building a public-access network from the start but chooses not to build, own or operate it. This decision may be driven by regulation, such as

^a 2007 Smart21 Community

national or state/provincial laws forbidding the public sector from providing telecommunications services. Politics may play a role: more than one local or state/provincial government has gotten into hot water by building networks that are drastically underutilized and stir taxpayer anger. Or it may be a matter of culture; for example, a principle that government must never compete with the private sector.

Public-private partnerships take many forms, limited only by imagination and the legal framework in which the municipality operates. In **LaGrange, Georgia, USA^a**, the city negotiated a deal in the 1990s that motivated a cable television company to develop a state-of-the-art broadband network. The city issued a municipal bond to fund network construction under an agreement in which the cable carrier agreed to lease back the network for its own use, with lease payments covering the debt service on the bond. In addition, the city retained a percentage of bandwidth for its own use, and went on to become a network and IT services provider to communities throughout the county.

In **Northeast Ohio^b**, the city of Cleveland, Case Western Reserve University, and major healthcare, arts and cultural organizations formed a nonprofit called OneCommunity. OneCommunity forged partnerships with the region's telephone and cable carriers, under which the carriers donated unused fiber-optic circuits to OneCommunity and OneCommunity contracted for last-mile fiber and VPN services from the carriers on behalf of its member organizations. To make the deal, OneCommunity had to overcome resistance to the creation of what carriers at first viewed as a new competitor. Eventually, all parties agreed that, by helping the public and nonprofit sectors become better users of IT and telecom services, OneCommunity saved them

^a 2000 Intelligent Community of the Year

^b 2008 Top Seven Intelligent Community

money while simultaneously boosting demand for broadband across the region.

LaGrange, Georgia, USA

- City issued municipal bond to fund fiber backbone
- Cable carrier leased back the network, with lease payments covering bond debt service
- City reserved bandwidth for its own use, went on to become network and service provider throughout county

Northeast Ohio, USA

- City and top institutions formed OneCommunity nonprofit
- Negotiated with carriers to transfer dark fiber assets to OneCommunity in exchange for last-mile contracts
- OneCommunity reduced member costs while boosting demand for broadband across region

Sunderland, England, UK

- Series of public-private joint ventures stimulated demand for broadband in business, government and residents
- Motivated carriers to deploy broadband at up to 10 Mbps

Ottawa, Ontario, Canada

- Volunteer-driven Ottawa Rural Communities Network project built awareness and aggregated rural demand
- City funded one-third of C\$3 million network deployment

In the poor North-of-England community of **Sunderland**^a, carriers could make no business case for investing in broadband. Beginning in the 1990s, the government entered a series of small public-private partnerships with emerging carriers and technology companies. One built “Teleport House” at a successful local business park to ensure connectivity to the park's tenants. Another created the “Sunderland Hub,” an ISP and e-government network for local businesses and community centers. None was an overwhelming success

^a 2003-07 Top Seven Intelligent Community; 2007 Lifetime Achievement Award Winner

in itself. But by demonstrating demand and the government's determination to ensure access to services, it ultimately motivated the UK's leading carriers to deploy broadband at competitive rates at speeds up to 10 Mbps.

In **Ottawa**^a, the capital of Canada, local government spurred the formation of a volunteer group, the Ottawa Rural Communities Network (ORCnet) to build awareness about broadband and aggregate demand in rural areas. Through workshops, community meetings and work with the telecom sector, ORCnet helped service providers build a business case for extending broadband into low-density markets. Local government invested C\$1 million in a C\$3 million public-private partnership that built out a rural broadband network to close the urban-rural gap.

4. Dark Fiber and Open Access Networks

Yet another variation on deployment strategy leverages the municipality's control of its roads and rights of way to encourage the private sector to invest. In these communities, government stops issuing permits to carriers to lay cable or fiber and instead builds its own comprehensive network of conduits throughout the municipality and lays "dark fiber" throughout the network. It then leases access to the fiber to carriers.

By digging up the streets once and then closing them to further construction, local governments protect their citizens from the disruption of repeated road work. Competitive carriers – though not necessarily incumbents – react positively, because starting up service becomes as quick and easy as connecting equipment to both ends of the circuit. The municipalities price the leases to cover their construction and maintenance costs as well as providing a positive return on investment. In some cases, the municipalities go a step further

^a 2007 Top Seven Intelligent Community

by creating an “open-access network“ platform that permits carriers to provision services faster and more cost-effectively, which tends to encourage competition and service innovation.

In Sweden, the city of **Karlskrona**^a, decided to make a revolutionary change in the way telecommunications services were provided within its borders. Based on its success in attracting the corporate headquarters for several mobile phone companies in the 1990s, Karlskrona branded itself “Telecom City” and directed its municipal utility company, to build and operate a fiber network serving business and government. The company, called Affarskverken, became a commercial ISP as well as a network operator. But the company’s services failed to generate subscriber growth. In 2004, city leadership changed the rules, directing that Affarskverken exit the services business and become an open network platform on which other service providers would deliver services to customers. These service providers were strongly encouraged not to lock customers in with long-term contracts as the city sought to position itself as a test-bed for new services. The Affarskverken network was reconfigured to become a competition-neutral, open-access network that allowed service providers to build and manage services on demand. Over the next two years, new service providers flocked to the network, including seven ISPs, five IPTV providers, two VOIP companies as well as suppliers of movies, music and local news. A public-private partnership has also successfully deployed an IPTV telemedicine service to residents.

Karlskrona, Sweden

- Government-funded fiber carrier deployed fiber network to serve business and government customers
- After failing to gain subscribers, carrier converted to open access network on which other providers could deploy services while carrier operated “physical layer”
- Attracted IPS, IPTV, VOIP and video-on-demand suppliers

^a 2007 Smart21 Community

Loma Linda, California, USA

- In support of Loma Linda Standard, built an open-access “transport only” fiber network
- Gave a wide range of service providers cost-competitive access to customers

Neunen, Eindhoven, Netherlands

- OnsNet (“Our Net”) cooperative, with financial support from Dutch government, deployed FTTP network
- Financed operation and debt service from member fees
- Achieved 97% penetration in six months based on Broadband Social Covenant

Open-access networks are not confined to Europe. Not content with just setting development policy (see page 21), the California city of **Loma Linda** went on to invest nearly US\$30 million to build an open-access fiber network to meet its own communications needs and interconnect the fast-expanding array of new developments and renovation projects. Like Karlskrona, Loma Linda entered the “transport” business without becoming a service provider: in the jargon of the telecom industry, it became a “carrier’s carrier” rather than a competitor. The municipality owns and operates a city-wide IP matrix consisting of multiple, redundant fiber optic loops with wireless coverage areas serving residential and business customers. Building cabling systems and other networks can connect to the city network so long as they follow The Loma Linda Standard codes. There is no requirement that anyone connect to the Loma Linda network but as a public utility it is able to offer considerable cost savings over alternatives.

The OnsNet project in Neunen, part of the **Eindhoven**^a metropolitan area in the Netherlands, has taken a unique “coop” approach to fiber deployment. OnsNet, which means “Our Net” in Dutch, is owned by its members, 7,500

^a 2008 Smart21 Community

households in Neunen, including retirement and assisted living facilities for its large elderly population. OnsNet used a subsidy from the national government to generate the capital needed to deploy a fiber-to-the-home network but operates it from membership fees.

The supposedly high cost of fiber deployment, says Kees Rover, is high only for a carrier seeking to run fiber to thousands of homes. For the individual homeowner, it is a relatively small cost for a home improvement that will boost the value of the property.

The coop was created by Kees Rover, CEO of a nonprofit management company called Close the Gap, and Henri Smits, director of the local housing association. Within six months of lighting the network, OnsNet had a 97% penetration rate, essentially eliminating the market share of Dutch carriers KPN and UPC. Rover attributes their success to the cooperative nature of the project, which he calls the Broadband Social Covenant. The supposedly high cost of fiber deployment, he notes, is high only for a carrier seeking to run fiber to thousands of homes. For the individual homeowner, it is a relatively small cost for a home improvement that will boost the value of the property.

5. Direct Competition

The most aggressive posture a community can take is to invest public funds in setting up a broadband carrier, building a network and delivering service to organizations and individuals. Local government typically takes this path after repeated attempts to interest incumbent carriers in upgrading networks have failed because the carriers could not make a business case

for investment. Since municipalities need to earn a return sufficient only to pay capital and operating costs, they can frequently make such a case themselves – particularly if they already own and operate water, gas or electric utilities, as many small rural communities do. Owning these utilities means that the community already has facilities running into every home and business, as well as a backbone communications network in place to control operations.

Some communities simply decide to think differently about broadband. As the Mayor of **Fredericton, New Brunswick, Canada**^a has put it, “we don’t charge people to walk on our sidewalks; why would we charge them for broadband?” This was the argument used to help justify development of the Fred-eZone in Fredericton. Having built a money-saving network for government and institutional customers starting in 2000, the city used it as a backbone for a network of 300 WiFi access points covering an eight-square-kilometer (3 sq mi) zone, and made access free to all. The costs are considered part of the city’s regular infrastructure operating budget.

Spanish Fork^b is a rural community of 25,000 people in the US state of Utah. With very limited Internet access and no broadband availability, the community deployed a downtown wireless broadband zone in 2000 and, in 2001, used public funds to build a hybrid fiber-optic and coaxial network throughout the municipality. By mid-decade, broadband was available to 100% of residents and businesses, all schools had fiber-optic interconnection to government offices and the nearest state college, and broadband penetration had reached 40%.

Fredericton, New Brunswick, Canada

- When the carrier declined to invest, the city developed money-saving municipal fiber network in 2000
- Fiber network became the backbone for Fred-eZone free WiFi network covering 8 sq km of downtown

^a 2008 Top Seven Intelligent Community

^b 2006 Smart21 Community

Spanish Fork, Utah, USA

- Lack of broadband led this rural city to build downtown WiFi network and hybrid fiber-coax network in 2000
- By mid-decade, achieved 40% broadband penetration and 100% fiber penetration to government offices and schools

Pirai, Brazil

- Pirai Digital City program involved city, universities and federal grants in bringing broadband to rural city
- 14 Mbps wireless coverage in city core, including network of free kiosks

Westchester County, New York, USA

- Carriers declined to invest in broadband, preferring nearby New York City market
- County aggregated demand from 43 municipalities, agencies and departments worth US\$10 million per year
- Cable TV carrier built and operates 800-mile fiber network reaching every corner of the county and serving 3,500 businesses and government agencies

In 2004, fewer than 6% of Brazilians, or 11 million people, were users of the Internet. Of these, about 6% had access to broadband connections, and 90% of them lived in Brazil's biggest cities. Yet, in February of that year, the little city of **Pirai**^a, located about 70 kilometers (44 miles) outside Rio de Janeiro and with a population of 23,000, switched on a wireless broadband network providing 14 Mbps of connectivity to every public facility, from the town hall to public schools and street kiosks. In 1996, Pirai elected a new mayor, Luiz Fernando de Souza, who felt strongly that communications and information technology should be part of the city's future. The Brasilia University was invited in 1997 to develop an IT master plan for Pirai and, beginning in 2001, the city won a series of grants and loans to plan a "Pirai Digital City" project. Mayor Souza's government formed an advisory board

^a 2005 Top Seven Intelligent Community

made up of representatives from government, residential associations, academic and nonprofit organizations, business and labor unions to oversee the continued evolution of the plan. The city formed alliances with local businesses that could provide expertise, and with a competitive telecommunications company that could help connect nodes in the wireless network. The Pirai branch of CEDERJ, a consortium of public universities offering online courses, agreed to create an Educational Technology Center on its premises to oversee implementation. These moves, plus a re-thinking of the network requirements, allowed Pirai to drive down the cost by a factor of eight, and made it possible to finance the project within the city's budget, with only modest assistance from the national government.

When incumbent carriers ignored it in favor of neighboring New York City, **Westchester County**^a in New York State, USA responded by developing the Westchester Telecom Network, a multi-gigabit fiber backbone that now extends over 800 miles (1278 km) into every corner of the 500-square-mile (1295 km²) county. The county government worked with 43 local governments, an independent library system, major hospitals and dozens of school and water districts to pool communication budgets worth \$50 million over five years. This long and intensive effort provided all the incentive needed for a cable TV company, Cablevision Lightpath, to build the network. Over 3,500 companies have connected directly to the Westchester Telecom Network, as well as more than half of all municipal agencies in the county, and all of the county's schools, libraries and hospitals.

Do such actions by local government represent “unfair competition” with business? Certainly. But the private sector should be cautious about claiming the moral high ground in such situations. No business has an eternal right *not* to invest

^a 2008 Top Seven Intelligent Community

in a market while simultaneously preventing others with a public or economic interest from doing so.

Avoiding the Ownership Trap

As communities plot their broadband future, it is helpful to keep one thing in mind. The funding, ownership and operation of a broadband network can and often should be separated. One organization does not have to pay for, own and operate the infrastructure. This was the founding model of the telephone industry, but that does not make it the only workable model. Funding can come from many different public and private-sector sources, including barter of existing facilities. The owner of the physical facilities may not be the operator that keeps the circuits powered up and the bits flowing. And the operator may just run what is called in techspeak “the physical layer,” leaving the network open to multiple service providers who pay the operator for access to that layer and deliver their services such as Web access or email to customers. The nature of today's broadband networks makes it possible to be extraordinarily creative in assembling a package of infrastructure, operations and services to meet the community's needs.

Meeting the Obstacles

Whatever path a community follows, it can expect to find obstacles in its way. Generally speaking, they grow with the community's ambition. Developmental policy favoring broadband adoption is unlikely to be controversial, since such policies are widely accepted. Having government go into the telecom business, on the other hand, can ignite controversies rising to the national level. The following are the most typical obstacles that communities meet, and ways to surmount them.

Sustainable Economic Models. Not every community can or should build its own network in competition with the private

sector. No community should rely blindly on the wisdom and generosity of private-sector partners to meet the community's needs. In 2007 in the USA, there were headlines about problems with municipal broadband networks. Several well-known communities including San Francisco, Chicago, Philadelphia and Houston had previously entered into partnerships with Earthlink in which the carrier agreed to pay all development costs for a municipal wireless network and provide a minimum level of free service to low-income residents, in return for operating a paying service for others. In August 2007, the company reversed itself and demanded that cities pay for network construction. When its terms were rejected, EarthLink withdrew from the projects. Columnists bewailed the demise of “muni wireless,” but the real lesson of the experience is a very old one: you can't get something for nothing. The planned networks never had sustainable business models, and it merely took EarthLink some time to realize the truth and deliver the bad news to its customers.

Communities considering any role in building telecom systems must find an economic model that makes basic business sense and is highly conservative in its estimates of revenue and expenses. Revenue will take longer than expected to grow, due to countless obstacles that will be discovered after the network is activated. Expenses will be higher than expected because they always are. No organization will do anything for free that is worth doing in the first place.

Sustainable Economic Models

- Develop conservative business case, underestimating revenues and overestimating expenses

Competitive Response

- Expect legal and regulatory response from private-sector carriers
- Incorporate delays and obstruction into business case

Manage Stakeholder Expectations and Priorities

- Appeal to stakeholder ideals (community service, social inclusion, economic growth) and self-interest (better service, cost reduction, acknowledgement, risk reduction)
- Provide consistent leadership to keep focus on the goal and progress toward it
- Focus last, not first, on technology options

Competitive Response. When governments decide to spend public money on any kind of telecommunications investment, they should expect a competitive response from the private sector. This can come as a shock. Governments are not accustomed to competition. They are further disadvantaged in any competitive encounter by the fact that, in democratic countries at least, their plans and budgets are public knowledge, whereas the private sector is entitled to keep secrets.

Private-sector competitors can respond in several ways. Legal and regulatory challenges are a nearly universal first response. Depending on the legal environment, the challenge may be offered in Council and other municipal public meetings, through appeal to state or provincial agencies, or by introducing legislation at the state, provincial or even national level. In some jurisdictions – including most of the USA – carriers can throw sand in the gears simply by filing a lawsuit to which the municipality is forced to react. The effectiveness of these tactics varies. When the small city of Glasgow, Kentucky, USA proposed to compete with the local cable TV provider, the company sent executives to a town meeting, where they told the good people of Glasgow that running a cable system was too challenging for their little minds. This bit of lobbying proved decisive: the Council voted overwhelming to build a network. But while some private-sector challenges are ham-handed, far more hit home. In May 2007, the European Commission ruled in favor of incumbent telcos that the city of Prague could not deploy a municipal wireless network because it would compete unfairly with the

private sector and did not aim to cure a “market failure.” In the US, thanks to effective business lobbying, seven of the 50 states have laws restricting the right of municipalities to offer communications services, and a further 13 specifically regulate municipalities in this area.

When communities win the right to deploy networks, however, there can be more challenges to come. Determined private-sector competitors can and frequently have priced their services at or below the offerings of the city, willing to risk losing money in order to maintain market share. Public investment also frequently motivates private carriers to make investments that they would not otherwise make. This is a net public benefit, whatever its impact on a municipal network project. But wise city planners take this possibility into account by ensuring that the business case makes sense even under strong competitive assault.

Managing Expectations and Priorities among Constituents and Partners. When government embarks on network development, it can be a long road. Successful Intelligent Communities create a high degree of collaboration among many partners: government agencies, school districts, institutions such as hospitals and universities, local communications and technology providers, businesses and business groups, and community groups and important citizen leaders. It is a complex ecosystem with many moving parts, each with different needs and concerns but all drawn to an opportunity to make the community a better place – as well as for some kind of personal gain. The following should be key features of any successful network development project:

- *Appeal Both to Ideals and Self-Interest.* In any collaborative endeavor, human beings have two motives, and success typically requires that you address both. There is the higher purpose: economic growth, social inclusion, building a better future, or cultural preservation. This is the

“headline” that garners initial excitement and support. But the endeavor must also serve the self-interest of each party involved, whether it is for better service, increased income, reduction of risk or simply acknowledgement. In a collaborative project, all parties will typically share an interest in the higher purpose, but each may have a different self-interest, and organizers should put time into understanding the different motives and structuring the endeavor to serve as many of them as possible.

- *Leadership with a Consistent Vision.* It is vital to have a small group of effective, well-respected individuals define the vision for the project, agree on reasonable expectations and – most important of all – deliver a consistent message. This group does not do all the work: they turn to a much larger group to work out social and economic goals and impact, technology requirements, legal issues and political considerations. But steady leadership that persuades everyone of the importance of the goal – and keeps everyone focused on it over the long haul – makes the difference between success and failure.
- *Technology Comes Last.* In a network project, most people start by thinking about technology. “We need wireless,” they say, or “Let’s do fiber-to-the-home.” But technology only succeeds when it is well designed to serve a particular purpose. The technology is just an enabler of the vision and goals of the project. It cannot overcome legal, regulatory or political obstacles. Technology is the “how,” not the “what” or “why.” Until you know what you want to do and why you want to do it, it is impossible to say accurately what kind of technology will do the job.

Private Property and the Public Good

The history of telecommunications is the story of tension between private property and public good. But history also