

The Case for Fiber in Portland: the benefits gigabit networking offers the community

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1. Introduction

This report offers a brief assessment of some of the benefits that are likely to flow from construction in Portland of a next-generation, gigabit-capable communications network.

A gigabit network will bring state-of-the-art, next-generation infrastructure to the City—infrastructure of a sort that is found only in a handful of American jurisdictions. That new infrastructure—and the service it enables—will prove to be a differentiator for Portland in a range of ways, making it first among equals among its competitor cities in the United States and positioning it (with Seoul, Tokyo, and Hong Kong) among the most connected coastal cities in the world. We summarize below some of the economic development benefits and innovations that the infrastructure will enable.

In addition to quantifiable economic benefits, offering a next-generation fiber network to the 248,546 households in Portland would provide substantial educational, environmental, and health benefits.¹ These “beyond the balance sheet” benefits are not reflected on profit and loss statements but still represent an important intangible “return” to Portland citizens.

New gigabit networking in Portland will also deliver unquantifiable benefits—a path to the digital future that ensures Portland’s place in the innovation economy. Technologists have noted that gigabit fiber networks, as they emerge, will “affect our way of working and playing as profoundly as did the telegraph, telephone, railroad and original Internet. A fiber network is an investment that would last 50 years or more.”² Indeed, fiber—like access to roads and waterways—is a key tool for economic development.

It is no exaggeration to say that the Internet has changed the way most Americans work, communicate, and live their lives. Almost every personal and commercial activity undertaken by Americans has been changed by the Internet—family communication, social engagement, gaming, banking, searching for jobs, interacting with government. Even during a time when most users had dial-up or relatively slow cable or DSL broadband connection, the Internet enabled the creation of applications and services that, as recently as 15 years ago, were impossible to imagine.

Now imagine the innovation and possibilities presented by truly high-speed, abundant, unconstrained fiber connectivity. Fully-fiber networks hold the promise of expanding on existing innovations and acting as a springboard for innovations that we cannot yet imagine.

¹ U.S. Census Bureau, 2010 Census (DP-1 Profile of General Population and Housing Characteristics) http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1.

² Bill Schrier, “The Future Is Fiber,” *Government Technology*. June 3, 2009.at 37 (http://www.seattle.gov/broadband/docs/SeattleFTNBenefits_091109.pdf) (accessed Jan 2, 2014)

2. Gigabit Network Construction Will Stimulate Economic Activity

Construction of a gigabit network in Portland will create new economic activity. Based on our engineering experience, we estimate that local construction could entail expenditures of as much as \$300 million for construction and deployment of network infrastructure to Portland's 583,776 residents.³ This investment will have a significant positive economic impact on the Portland economy—ranging from an estimated \$300 million to \$750 million, based on various methodologies.

The Congressional Budget Office (CBO) assigns a multiplier ranging from 1 to 2.5 to “[p]urchasing goods and services—for instance, by funding construction and other investment activities that could take several years to complete.”⁴ The multiplier represents the “estimated direct and indirect effects on the nation’s output of a dollar’s worth of a given policy.”⁵ Applying a conservative estimate of project costs, construction of a gigabit network in Portland will create \$300 million to \$750 million of economic activity.

The Bureau of Economic Analysis (BEA) uses a 2.01 output multiplier for Information-Telecommunications investments, suggesting that every new dollar invested in the telecommunications utility industry in Portland will generate \$2.01 of economic activity. This growth not only includes direct expenditures in the telecommunications industry, but also induced expenditures, including purchases made by employees and money circulated through the economy. The BEA multiplier applied to the anticipated cost of a gigabit network suggests that the construction will create \$603 million in economic activity.

The Center for Strategic Economic Research, an economic research and consulting group specializing in applied research and strategy development in the regional economics and economic development fields, applies a multiplier of 0.83 to infrastructure and public works projects, including telecommunications construction. Specifically, the Center explains that every \$1 million of public works and infrastructure construction supports an additional \$825,858 of output through indirect and induced activities.⁶ Applying this model to a potential gigabit

³ U.S. Census Bureau, State and County Quick Facts, Portland, Oregon (2010 Population) (<http://quickfacts.census.gov/qfd/states/41/4159000.html>).

⁴ Congressional Budget Office (CBO), May 2011, Pub. No. 4284, “Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from January 2011 Through March 2011,” at 1 & 6 (Table 2) (note that Table 2 is limited to “Major Provisions of the American Recovery and Reinvestment Act” and does not explicitly mention broadband deployment. Nonetheless, telecommunications construction can clearly be deemed a purchase of goods and services by the federal government, thus supporting use of this multiplier).

⁵ *Id.* at 4.

⁶ SRRI, “Stimulus Calculation Tool: Statewide Economic Impacts of Construction Spending in California” (82) (applying a 0.83 multiplier to “[a]irport runways, buildings, & related work; arenas, stadiums, & other recreational facilities; bridges, tunnels, & elevated highways; harbor & port facilities; highways, streets, & related work; levee, dam & reservoir construction; mass transit construction; parking facilities; petroleum refineries, chemical facilities, & related work; pipeline construction; power & communication transmission lines; power plants; sewage & water

network, \$300 million in expenditures will ultimately support an additional \$249 million in direct and indirect economic benefits.

3. Gigabit Construction and Operations Will Create Local Jobs

A gigabit network will have direct economic and financial benefits as a result of the jobs created in Portland during the construction and operations phases of the project.

Construction and operation of a gigabit network to homes throughout Portland will directly create a significant number of construction and operations jobs.⁷ More importantly, for long-term economic development, new indirect jobs and economic activity will also result from the capabilities created by new broadband services. While projections of the precise economic effects vary, studies consistently find a positive impact on communities that deploy broadband.

The Communications Workers of America project that each \$1 million invested in broadband creates 20 jobs.⁸ The U.S. Bureau of Economic Analysis assigns a jobs multiplier of 9.10 for the telecommunications sector.

According to the Bureau of Economic Analysis, nearly one-third of the job creation associated with telecommunications investments are in the Information sector. The next five highest industries by employment impact are professional services, administrative services, retail trade, real estate, and health care.

Studies identify a range of categories of direct job creation from broadband initiatives. First, there is direct labor associated with construction and deployment of the network. This includes the technicians and construction workers who lay the broadband pipes.⁹ Second is the category of job growth comprised of the direct labor associated with installing the infrastructure components and equipment that take the fiber to the user location. This includes optical fiber, wireless tower structures, and network electronics.

In the first category of job creation, gigabit construction in Portland will have an immediate impact in the construction and information technology sectors (based on our observations of

treatment plants; sewers, water mains, & related facilities; solid waste disposal facilities; and water storage facilities”).

⁷ Executive Office of the President National Economic Council, “Recovery Act Investments in Broadband,” at 12 (<http://www.whitehouse.gov/sites/default/files/20091217-recovery-act-investments-broadband.pdf>) (accessed Jan. 3, 2012).

⁸ Eric Auchard, “The Case for a Broadband Bailout,” Reuters (Opinion), Feb. 13, 2009 (<http://www.reuters.com/article/reutersComService4/idUSTRE51C2W920090213>) (accessed Nov. 6, 2012).

⁹ Robert D. Atkinson, Daniel Castro and Stephen J. Ezell, “The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America,” ITIF Study, Jan 7, 2009, at 2 (<http://www.itif.org/files/roadtorecovery.pdf>) (accessed Dec. 30, 2013).

similar efforts elsewhere). In construction, workers would immediately engage in engineering, planning, and environmental compliance. During the intensive construction phase of the next few years, workers will dig ditches and trenches, place fiber in the ground and on utility poles, and build towers for aerial connections. Additional workers will place and configure communications equipment, manage installation, repair towers and lines, and interact with customers. Some of these direct benefits will accrue to workers from outside the community. Nonetheless, these workers will benefit the local economy because they will purchase fuel, eat at local restaurants, and sleep in local hotels.

In the second category of job creation, deployment of a gigabit network will directly create jobs, primarily in the skilled technology area, as workers install and activate communications equipment and other materials that are essential for operation of the fiber optics. A further category of jobs will be created for such ongoing services as network operations and equipment maintenance.

CTC engineers undertook an independent analysis of likely job creation based on our 30-year experience analyzing, testing, and designing communications networks and on our observations of fiber deployments elsewhere. Our analysis is also based on our direct experience with network projects in other cities that are substantially similar to Portland.

On these bases, we conservatively estimate that at least 597 jobs per year will be created in the construction phase of a Portland build-out and that at least 130 jobs will be created per year in the operations phase for fiber maintenance and network operations (not including sales, marketing, and other ongoing jobs related to customer support, which could support another 32 jobs).

Our analysis is summarized in the table below.

Table 1: Estimate of Job Creation During Network Implementation and Operations

Implementation					
Item	Unit	Avg. Hours per Unit	Project Scope	Estimated Total Hours	Annual FTEs (assumes 3-year buildout period)
Project Management and Quality Control	Miles	110.5	4,140.0	457,581.0	73.3
Physical Plant Engineering and Permitting	Miles	82.4	4,140.0	341,062.9	54.7
Construction	Miles	579.1	4,140.0	2,397,577.5	384.2
Network Electronics Design and Deployment	Subscribers	4.0	132,500.0	530,000.0	84.9
			Total:	3,726,221.3	597.2
Operations					
Item	Unit	Annual Hours per Unit	Project Scope	Estimated Hours	Ongoing FTEs (annual)
Fiber repairs	Miles	20.0	4,140.0	82,800.0	39.8
Fiber Locates / service drop maintenance	Miles	41.6	4,140.0	172,224.0	82.8
Customer support and sales	Subscribers	0.50	132,500.0	66,250.0	31.9
Network Engineering Support	Entire Network	16,640.0	1.0	16,640.0	8.0
			Total:	337,914.0	162.5

4. Gigabit Networking in Portland Will Narrow the Digital Divide

Construction of a fully fiber network will have a meaningful effect on Portland’s ongoing efforts to narrow the digital divide. More competition in the broadband market (as discussed in Section 7) could lead to lower pricing, which in turn would likely spur adoption among those who have not previously been able to afford broadband service or have not prioritized it.

We have seen, too, that providers entering other markets have promoted broadband adoption with services targeted to users who might otherwise forgo such connectivity. Google Fiber, for example, offers free Internet service (5 Mbps download/1 Mbps) for at least seven years to subscribers in Provo, Utah who pay a \$30 connection fee.¹⁰ Subscribers in Kansas City are eligible for the same free service, though the connection fee there is \$300 (or \$25 monthly for a year).¹¹

We believe this is a powerful force for digital inclusion in these markets. In our experience, the availability of an accessible, low-cost (almost no cost) product is likely to increase broadband use in communities and neighborhoods that have been left behind by the digital revolution.

¹⁰ “Provo: Plans and pricing,” Google Fiber website, <https://fiber.google.com/cities/provo/plans/> (accessed Feb. 13, 2014).

¹¹ “Kansas City: Plans and pricing,” Google Fiber website, <https://fiber.google.com/cities/kansascity/plans/> (accessed Feb. 13, 2014).

And the impact of increased broadband adoption can be dramatic for a community and for its economy: The Brookings Institution has measured the marginal value of increased broadband use, concluding that every 1 percent increase in broadband penetration leads to a 0.2 percent to 0.3 percent increase in annual employment growth.¹² Similarly, a study by the Sacramento Regional Research Institute found that each 1 percent increase in broadband use triggering 0.075 percent growth in employment and 0.088 percent increase in payroll. Even this modest projection translates to significant gains. The study concluded that a 3.8 percent increase in national broadband use over a decade would result in a cumulative 10-year gain of 1.8 million jobs and \$132 billion in payroll nationwide.¹³

5. Gigabit Networks Attract Population and Businesses

The U.S. cities that have pioneered gigabit networks have seen a documented phenomenon of new population and workers, particularly in high-tech, bandwidth-intensive fields, relocating to those cities. And those new residents and businesses have had the impact of creating new dynamism and development in local economies.

The *New York Times* reports, for example, that in Chattanooga, Tennessee, “‘The Gig’ allowed [the city] to attract capital and talent into this community that never would have been here otherwise.”¹⁴

According to the *Times*, since the network was activated four years ago, “the signs of growth in Chattanooga are unmistakable. Former factory buildings on Main Street and Warehouse Row on Market Street have been converted to loft apartments, open-space offices, restaurants and shops. The city has welcomed a new population of computer programmers, entrepreneurs and investors. Lengthy sideburns and scruffy hipster beards—not the norm in eastern Tennessee—are de rigueur for the under-30 set.”

“This is a small city that I had never heard of,” said Toni Gemayel, a Florida native who moved his software start-up, Banyan, from Tampa to Chattanooga because of the Internet speed. “It beat Seattle, New York, San Francisco in building the Gig. People here are thinking big.”

¹² Robert Crandall, William Lehr, and Robert Litan, “The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data,” The Brookings Institution, Issues in Economic Policy, July 2007, at 2 (www.brookings.edu/views/papers/crandall/200706litan.pdf).

¹³ “Economic Effects of Increased Broadband Use in California,” Sacramento Regional Research Institution, Nov 2007 (http://www.srri.net/AboutUs/EconEffectsGoogle_Research.pdf).

¹⁴ “Fast Internet is Chattanooga’s New Locomotive,” *New York Times*, February 4, 2014, http://www.nytimes.com/2014/02/04/technology/fast-internet-service-speeds-business-development-in-chattanooga.html?_r=0 (quoting Sheldon Grizzle, founder of the Company Lab, which helps start-ups refine their ideas and bring their products to market).

Similarly, in Wilson, North Carolina, “the city focused its ‘Greenlight’ gigabit beam on its local business incubator, the Upper Coastal Plan Business Development Center,” to attract high-tech entrepreneurs.¹⁵

In Kansas City, Google Fiber’s residential network provides substantial economic benefits to area startups, which operate out of people’s homes. Attracted by the high Internet speeds, low cost of living, and high quality of life, Google Fiber has served as a “lightning rod” that draws people to the community.¹⁶ As young entrepreneur Nick Budidharma (who came to Kansas City from Hilton Head, South Carolina) explains, “It’s hard to develop a business when you have to think about the cost of Internet and speeds.” In Kansas City, however, “You don’t even have to consider it.”¹⁷

Google’s new infrastructure has served as an entrepreneurial “catalyst,” creating “a ripple effect of entrepreneurial activity,” according to Lesa Mitchell, a vice president at the Kauffman Foundation, the leading nonprofit supporting entrepreneurial activity.¹⁸

Kansas City local Ben Barreth liquidated his retirement savings and purchased a home in one of the area’s first “fiberhoods” to create “Hacker House.” Barreth offers access to Google’s 1 Gbps service and rent-free accommodations for three months while entrepreneurs develop innovative broadband applications.

The availability of fiber is attracting knowledge workers to Kansas City from other parts of the country. Mike Demarais moved from Boston to develop Handprint, a 3D-printing software company.

Two dozen startups have taken up residence in a former industrial area known as Kansas City StartUp Village (KCSV). Mike Farmer, founder of mobile search app Leap2.com, reports that he meets several people that are looking to move to Kansas City every week.¹⁹ While there have always been a handful of innovators in the area, the growth has been dramatic with the advent of Google Fiber. A weekly gathering for hopeful entrepreneurs historically attracted a dozen people. That same gathering “recently attracted a standing-room-only crowd of 260 business-people, investors and city officials.”²⁰

¹⁵ “What it Means to Be A GigCity: Wilson Incubating Small Businesses,” SEATOA listserv posting, Feb. 7, 2014.

¹⁶ Mike Stanton, July 2, 2013, The Collegian, “Google Fiber leads to technology hotbed in Kansas City” (<http://www.kstatecollegian.com/2013/07/02/google-fiber-leads-to-technology-hotbed-in-kansas-city/>) (quoting Adam Arredondo, cofounder of an interactive community events website).

¹⁷ Cecilia Kang, Jan. 25, 2013, *Washington Post*, “Google Fiber provides faster Internet, and cities hope, business growth” (<http://wapo.st/1dINMst>).

¹⁸ *Ibid.*

¹⁹ Sudekum

²⁰ Kang

The growing density of start-ups is a key element of Kansas City's success. These pockets of innovation are growing around Google's "fiberhoods." Kansas City Startup Village, for instance provides a "concentrated and collaborative area of startups." Today, the Village is comprised of 24 technology-based startup companies residing in three neighboring houses.²¹

The same phenomenon has been noticed in Lafayette, Louisiana, which operates a public gigabit network. Pixel Magic, a special effects studio, built an office in Lafayette to support its work while making the movie "Secretariat," which was filming nearby. The LUS Fiber connection allowed the studio to be so productive that it ultimately established a permanent office in the community, providing 100 to 200 full-time jobs. The company acknowledged the existence of the network supported its decision: "The fact that we have the high-speed Internet between here and there is a big plus so we can show the clients the work in progress—production companies and studios."²²

Pixel Magic's experience is not unique. The high-speed and low-cost network prompted Scott Eric Olivier, owner of the tech startup firm Skyscraper Holding, to relocate to Lafayette from Los Angeles.

These economic development trends led the Bureau of Economic Analysis to rank Lafayette, Louisiana the "sixth-fastest growing economy in the nation in September 2011," with substantial growth in median household income during the period the network was launched. "Though much of Louisiana has benefited from its oil and gas resources during the recession, it was Lafayette that grew the fastest."²³

Launched in 2001, Bristol Virginia Utilities (BVU) OptiNet provides telecommunication services to nearly 12,000 subscribers in Southwest Virginia (near the Tennessee border). The network "has fundamentally changed the economic face of Southwest Virginia."²⁴

In 2007, BVU prepared a report laying out the economic benefits of its investment in broadband. The report documented over \$50 million in new private investment, generating 1,220 jobs in seven counties and \$37 million in annual payrolls. Subsequent analysis was even more positive, attributing over 2,000 well-paying jobs to the network.

The network has prompted businesses to locate and expand in the community. Northrop Grumman and CGI (a global IT and business process services firm) have created approximately

²¹ Visit <http://www.kcstartupvillage.org/villagers/startups/> for a list of KCSV startups to date.

²² Christopher Mitchell, April 2012, Institute for Local Self Reliance, "Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks," at 30 (available online at <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>).

²³ Mitchell at 30.

²⁴ Masha Zager, *Broadband Properties*, "Municipal FTTH Deployment Snapshot" (<http://www.bbpmag.com/snapshot/snap1002.php>).

700 jobs that pay roughly twice the average weekly wage in the community. Both companies “attributed a part of their location decision to the fact that they can get redundant broadband service with both Verizon and OptiNet in the area.”²⁵

The network has also enabled DirecTV (a partial competitor) to operate a virtual call center in Bristol. One hundred Bristol residents provide technical support to the company’s 25 million customers throughout the United States and Latin America.

OptiNet has not only led businesses to locate and expand in the region, but has also discouraged others from leaving. For instance, coal producer Alpha Natural Resources decided to maintain its headquarters in Bristol, despite merging with a company in the Washington, D.C.–Baltimore area. In 2010, the company began construction on a \$21 million corporate headquarter in the community. OptiNet allows the expanded company to readily communicate remotely with others.²⁶

To ensure that future opportunities continue to benefit Bristol residents, the nearby University of Virginia’s College at Wise created an undergraduate software engineering program in partnership with Northrop Grumman and CGI. The University is also managing a new Technology Development Center, which was launched in a former shopping center.²⁷

Chattanooga suffered a manufacturing decline in the 1980s but is currently the state’s fastest growing community. Much of this growth can be attributed to Chattanooga’s robust fiber network, which is among the fastest in the nation.

The Journal of Applied Business Research has found that the Chattanooga network could generate over \$350 million in social benefits and over 2,600 jobs in its first decade. These include 683 direct jobs and roughly three times that number indirectly. The economic benefits are attributed to increased tax receipts from job growth that is supported by the network.

²⁵ Cathy Swirbul, March-April 2007, *PublicPower*, American Public Power Association, “Broadband Boosts Economic Growth in Bristol” (<http://www.publicpower.org/Media/magazine/ArticleDetail.cfm?ItemNumber=18918>).

²⁶ Christopher Mitchell, April 2012, Institute for Local Self Reliance, “Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks,” at 15, <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>; see also Don McGee, May 12, 2010, TriCities.com, “Alpha Natural Resources holds groundbreaking for new headquarters” (for more background on merger and local employment benefits) (http://www.tricity.com/news/article_b77a8f24-7112-51e7-847e-23fa74a848ea.html).

²⁷ Masha Zager, *Broadband Properties*, “Municipal FTTH Deployment Snapshot” (<http://www.bbpmag.com/snapshot/snap1002.php>); see also Christopher Mitchell, April 2012, Institute for Local Self Reliance, “Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks,” at 15 (available online at <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>).

A more recent analysis was even more optimistic, projecting “3,600 jobs and more than \$580 million in economic value over the first 10 years.”²⁸ The Chattanooga Chamber of Commerce reports that interest in the community is the highest it has been in three decades. In January 2011, *Business Facilities Magazine* ranked Chattanooga as the top U.S. metropolitan area for economic growth potential.²⁹ Much of this growth can be attributed to the low cost of fiber—particularly relative to other communities.³⁰

In 2008, Volkswagen announced plans to invest \$1 billion to build its North American manufacturing headquarters in Chattanooga,³¹ selecting this location from nearly 400 alternatives that were considered nationwide.³² The facility supports 2,000 jobs for area residents and uses EPB’s fiber services in its downtown office.³³

Amazon is among Chattanooga’s most notable new employers. In 2011, the company chose to locate its one-million-square-foot distribution center in the city, a move that initially generated 1,400 full-time jobs and an additional 2,000 seasonal positions. Last year, the company reported that it was employing over 2,000 workers, with plans to expand and add hundreds of additional positions.³⁴

Fiber not only supports large-scale businesses, but inspires innovation for entrepreneurs who “are flocking to Chattanooga.”³⁵ Virtually unlimited bandwidth “allows individuals to pursue dreams of starting sole proprietorships from their homes.”³⁶ These dreams are launched by Lamp Post, a new venture capital firm in Chattanooga, which relies on the fiber network to help emerging companies build their businesses. The firm is credited with assisting in the creation of 50 new jobs in the latter part of 2011 alone.³⁷

²⁸ Christopher Mitchell, April 2012, Institute for Local Self Reliance, “Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks,” at 44 (available online at <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>).

²⁹ Mitchell, *Id.* at 46.

³⁰ Mitchell, *Id.* at vi.

³¹ Press Release: “Volkswagen Inaugurates New Plant in Chattanooga, TN,” Volkswagen. May 24, 2011. (<http://www.prnewswire.com/news-releases/volkswagen-inaugurates-new-plant-in-chattanooga-tennessee-122513618.html>).

³² Bill Visnic, Dec. 6, 2010, Edmunds Auto Observer, “To Become No. 1, Volkswagen Needs to Succeed in Chattanooga” (<http://www.edmunds.com/autoobserver-archive/2010/12/to-become-no-1-volkswagen-needs-to-succeed-in-chattanooga.html>).

³³ Christopher Mitchell, April 2012, Institute for Local Self Reliance, “Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks,” at 46 (available online at <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>).

³⁴ Mitchell, *Id.* at 46.

³⁵ Mitchell, *Id.* at 46.

³⁶ Mitchell, *Id.* at 30.

³⁷ Mitchell, *Id.* at 47.

6. Gigabit Networks Enable Economic Benefits Such as Enhanced Credit Ratings and Increased Property Values

Next-generation broadband is increasingly recognized as a differentiator for a city's economic outlook. Credit rating agency Fitch, for example, recently cited the construction of Google Fiber as one factor in its decision to upgrade Kansas City, Missouri's credit rating, thus lowering the city's cost of borrowing. Fitch noted:

Kansas City is a host city for Google Fiber, which is an ultra high-speed broadband network up to 100 times faster than current broadband. The network is already attracting a number of smaller internet and data companies to the city and has the potential to make a significant economic impact.³⁸

New gigabit-capable networks also create economic value in ways that benefit citizens of the community. For example, researchers have documented increased sale and rental values for homes with direct fiber connections, both in the United States and in Europe. According to Broadband Communities Magazine, "access to utilities makes private property more valuable, and FTTH is among the utilities that owners and renters especially value."

Indeed, direct fiber connections make "single-family homes easier to sell and multiple dwelling units easier to rent." The magazine cites a recent survey by RVA LLC that documents that home and condominium buyers will pay a 2 percent premium for a fiber-connected home and renters will pay a 15 percent premium.³⁹ This phenomenon has also been documented in Kansas City, where Google Fiber to homes is attracting businesses to those residences and increasing property values.⁴⁰

7. Gigabit Construction Will Enable the Benefits of Competition

"Competition is the main driver for improved services"⁴¹ in the broadband market, according to the leading broadband analysts in the United States. And the entry of a new provider into a community ripples in positive ways through the market.

³⁸ "Fitch revises Kansas City, Mo. outlook to stable, ratings affirmed," Reuters, February 11, 2013, <http://www.reuters.com/article/2013/02/11/idUSWNB0032L20130211>.

³⁹ Broadband Communities, "Fiber to the Home Primer," Fall 2013, www.ftthcouncil.org/ FiberPrimer (citing RVA LLC study).

⁴⁰ Karl Bode, "Google Fiber Raising Property Values As KC Businesses Relocate to Get Connected," DSL Reports, October 29, 2012, <http://www.dsireports.com/shownews/Google-Fiber-Raising-Property-Values-121817>.

⁴¹ Julie Sartain, "Google's Gigabit Internet: Not coming to a neighborhood near you," quoting Ian Keene, Research Vice President, Gartner. *Network World*, Nov. 19, 2013, <http://www.networkworld.com/news/2013/111913-google-internet-275938.html?page=1>

Google Fiber's entry into a few local markets has been the most well publicized example of new fiber-based competition over the past few years. The incumbent cable and telephone companies' initial responses have been fairly uniform in those cities: They have begun to offer faster service and more competitive prices.

- In Kansas City, Kansas, Time Warner Cable and AT&T have begun "bidding against Google to wire firms and city buildings with equally high-octane Internet." Time Warner bid for a contract to wire a new city-sponsored start-up incubator with gigabit speeds. City officials speculate that the bid was motivated by competition from Google Fiber—and note that this was the first time they had been approached by Time Warner in six years.⁴²
- Following Google Fiber's rollout in Kansas City, Kansas, the state "saw the largest jump in average Internet connection speeds of all U.S. states" for the quarter—a result attributed to the increased speeds Time Warner began offering to its subscribers there.⁴³
- In Austin, Texas, AT&T announced that it would roll out its own gigabit fiber network in the city about six months after Google announced its plans.⁴⁴ The company then declared that the GigaPower service had "officially launched"—noting that residents "can influence future deployment by voting for your neighborhood" on the company's website.⁴⁵

In neither city has the incumbents' pricing matched Google's monthly fee (which, at \$70, has been described as "dirt cheap"),⁴⁶ although AT&T does promise a "free upgrade to speeds up to 1 Gbps in 2014" for Austin customers who sign up for its 300 Mbps service at the same \$70 price.⁴⁷

Looking to the future, however, one industry analyst has posited that the effects of Google's competition in these markets may lead to better pricing not just in Kansas City and Austin, but in many other cities as well. "All [Google] has to do is introduce [Fiber] to a few selected markets and then watch how the cable operators in those markets respond. If they drop their prices to

⁴² Cecilia Kang, "Google Fiber provides faster Internet, and cities hope, business growth," *Washington Post*, Jan. 25, 2013, <http://wapo.st/1dINMst>

⁴³ David Talbot, "Google Fiber's Ripple Effect," *MIT Technology Review*, April 26, 2013, <http://www.technologyreview.com/news/514176/google-fibers-ripple-effect/>

⁴⁴ Jon Brodtkin, "Competition gets AT&T to follow Google's lead with gigabit fiber," *Ars Technica*, Oct. 1, 2013, <http://arstechnica.com/business/2013/10/competition-gets-att-to-follow-googles-lead-with-gigabit-fiber/>

⁴⁵ "AT&T U-verse with GigaPower now available in Austin," AT&T U-verse Support, AT&T website, <http://www.att.com/esupport/article.jsp?sid=KB422144&cv=803&requestid=339586#fbid=SEVs9W-vM0>

⁴⁶ Marguerite Reardon, "Is cable holding back superfast broadband adoption on purpose?" *CNET News*, June 17, 2013, http://news.cnet.com/8301-1023_3-57589353-93/is-cable-holding-back-superfast-broadband-adoption-on-purpose/

⁴⁷ "Introducing AT&T U-verse with GigaPower," AT&T website, <http://www.att.com/esupport/article.jsp?sid=KB422144&cv=803&requestid=339586#fbid=SEVs9W-vM0>

compete with the ultrafast, ultracheap Fiber, they'll have to do the same in other markets or else face uncomfortable questions from regulators about why they charge more in cities where they face less competition."⁴⁸

Even where the national media spotlight is not shining—specifically, in communities where municipal governments and utilities have built FTTH networks—incumbents faced with new competition have followed a similar script and increased their speeds, lowered their prices, or both.

In Tacoma, Washington—about 30 miles south of Seattle—the open access Click! Network operated by the municipal utility enables three Internet service providers (ISP) to offer broadband download speeds up to 100 Mbps.⁴⁹ Comcast offers a similar service in Tacoma, Seattle, and other nearby communities, and at a published rate that is significantly less than the lowest Click! Pricing (\$115 per month versus \$170).⁵⁰

In Burlington, Vermont, Comcast offers 105 Mbps downstream service for \$90 per month and 50 Mbps downstream service for \$60 per month. Both prices undercut the local municipal network, Burlington Telecom, which offers 100 Mbps downstream service for \$110 monthly and 50 Mbps downstream for \$85 monthly.⁵¹

Notably, Comcast's 105 Mbps downstream connections in Tacoma and Burlington are much faster than the 50 Mbps service the company offers as its highest tier in many other markets.⁵²

In another region of the country, Lafayette Utilities System (LUS) Fiber created competition for Cox Communications, the incumbent service provider, when it built an FTTH network in Lafayette, Louisiana. By February 2012, LUS Fiber had reportedly captured nearly one-third of Lafayette's 45,000 residential and business subscribers. LUS Fiber Director Terry Huval noted that, to compete, Cox "slashed its rates for some residents and business customers, lowering TV and Internet bills across the city."⁵³ In this way, the network has benefited subscribers and non-subscribers alike.

⁴⁸ Jeff Bercovici, "Google's Not-So-Evil Plan To Lower Your Cable Bill," quoting Jason Bazinet, Managing Director, Citi Investment Research. *Forbes*, June 11, 2013,

<http://www.forbes.com/sites/jeffbercovici/2013/06/11/googles-not-so-evil-plan-to-lower-your-cable-bill/>

⁴⁹ "Internet," Click! Cable TV website, <http://www.clickcabletv.com/internet>

⁵⁰ Comcast pricing based on sample search for service in Tacoma, WA 98406 on Comcast consumer website, <http://www.comcast.com/internet-service.html>

⁵¹ Comcast pricing based on sample search for service in Burlington, VT 05401 on Comcast consumer website, <http://www.comcast.com/internet-service.html>; "Burlington Telecom Residential Services," Burlington Telecom, <http://www.burlingtontelecom.net/Residential>

⁵² Reardon

⁵³ Rick Jervis, "Louisiana city blazes high-speed Web trail," *USA Today*, Feb. 5, 2012, <http://usatoday30.usatoday.com/news/nation/story/2012-02-01/broadband-telecom-lafayette/52920278/1>

This increased competition has had substantial economic benefits for Lafayette. LUS estimates that the fiber system created \$250,000 in savings in 2009, over \$4 million in 2010, and \$5.5 million in 2011. The Utility projects a total savings ranging between \$90 million and \$100 million over the project's first decade.⁵⁴

8. Gigabit Fiber Networks Create Educational Benefits

Adequate broadband enables a range of educational applications. In addition, it is absolutely necessary to enable some core educational functions. Portland already has advanced infrastructure to schools, which facilitates these advances in the classroom. Extension of fiber to the home (and service that most Portland families can afford) would mean that such educational opportunities would not abruptly terminate at the classroom door. Indeed, as robust networks to the schools expand resources in the classroom, home connectivity remains “the major unresolved issue for technology directors.”⁵⁵ As school Internet use becomes more pervasive, this disconnect will become increasingly pronounced. This is particularly true with the growing popularity of one-to-one computer programs, cloud computing, electronic textbooks, and flipped classrooms. The new gigabit network will enable Portland students to access these resources at home.

America's classrooms are migrating to one-to-one computer programs (also known as “ubiquitous computing”), whereby each student and teacher has one Internet-connected wireless computing device for use both in the classroom and at home. A 2006 survey found that 31 percent of superintendents are implementing ubiquitous computing in at least one grade, up from an average of 4 percent. Moreover, over 75 percent of superintendents recognized the potential benefits of one-to-one computing, agreeing with the statement that “ubiquitous technology can reduce the time, distance, and cost of delivering information directly to students and that teachers can spend substantially more one-on-one time with each student and personalize the education experience to each student's needs.”⁵⁶

By 2007, 78.7 percent of U.S. school districts reported moderate to significant improvement in one-to-one computing programs,⁵⁷ with potentially significant benefits for student learning. The 2006 America's Digital Schools report found that one-to-one computing programs correlated

⁵⁴ Christopher Mitchell, “Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks,” Institute for Local Self Reliance, April 2012, p. 28. <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>

⁵⁵ “America's Digital Schools 2006: A Five-Year Forecast, 2006,” at 19 (http://www.k12hsn.org/files/research/Online_Learning/ADS2006KF.pdf).

⁵⁶ “America's Digital Schools 2006: A Five-Year Forecast,” The Greaves Group and The Hayes Connection, at 15 & 18 (http://www.k12hsn.org/files/research/Online_Learning/ADS2006KF.pdf) (accessed Dec. 31, 2013).

⁵⁷ Meris Stansbury, “Researchers Identify Key Ed-Tech Trends,” eSchoolNews, May 15, 2008. <http://www.eschoolnews.com/news/top-news/index.cfm?i=53795&page=1>. (Summarizing Thomas W. Greaves and Jeanne Hayes, “America's Digital Schools Report 2008: The Six Trends to Watch.”)

with increased student retention and attendance, improved writing skills, and reduced disciplinary problems.⁵⁸ As Michael Davino, Superintendent of Schools in Springfield, New Jersey explains, “[a] wireless laptop program provides up-to-date information, access to virtual experiences, instant feedback, individualized attention for all learning styles, student independence, and constant practice. And it’s highly adaptable to individual, small group, or whole class instruction.”⁵⁹

To be effective, however, these devices need to be usable at home. Indeed, “[p]eople increasingly expect to be connected to the Internet and the rich tapestry of knowledge it contains wherever they go.”⁶⁰ The portability of mobile devices (including smart phones and tablets) allows just that—as long as there is adequate Internet access. Consequently, a growing number of schools have turned to tablets as a “cost-effective strategy for one-to-one learning,” which can “support learning in and outside of the classroom.”⁶¹ As one-to-one computing allows students to take computers out of the classroom, FTTH will provide the technological resources to help them extend the school day and continue their lessons.

A recent report by the New Media Consortium⁶² assesses six technologies along three adoption horizons that indicate their anticipated entrance into mainstream use for teaching. Near-term (immediate) technologies include cloud computing and mobile learning. Over the next two to three years, NMC anticipates growing use of learning analytics and open content. And over a “far-term” (four- to five-year horizon), NMC anticipates an increased use of 3D printing and virtual and remote laboratories. While these technologies are applied directly in the K-12 setting, they will be more successful if applied outside the boundaries of the school.

The benefits of unbounded connectivity are evident in the use of cloud-based services at Hobart Middle School in Indiana. There, teachers use Google Drive, Facebook, and Twitter to allow students to keep up with their classwork and engage with the classroom from home. These tools have allowed teachers to provide students with real-time feedback, even when they are outside the classroom. Eighth grader Jessica Macias experienced the benefits of this “virtual classroom” when she recently missed a day of school due to illness. She was able to log into her social studies class from home using Google Apps. By accessing the cloud, Macias was able to view the assignment and agenda and observe her teacher’s lecture as a slide show. She was able

⁵⁸ “America’s Digital Schools 2006: A Five-Year Forecast, 2006.” 15.

(http://www.k12hsn.org/files/research/Online_Learning/ADS2006KF.pdf) (accessed Dec. 31, 2013).

⁵⁹ *Id.* at 18.

⁶⁰ Johnson, L., Adams Becker, S., Cummins, M., Estrada V., Freeman, A., and Ludgate, H. (2013). *NMC Horizon Report: 2013 K-12 Edition*. Austin, Texas: The New Media Consortium, at 16.

⁶¹ Johnson *et al*, *Id.* at 17.

⁶² “NMC Horizon Report: 2013 K-12 Edition,” New Media Consortium, 2013. <http://www.nmc.org/pdf/2014-nmc-horizon-report-he-EN.pdf>

to observe the other students using the system in real time as well. As a consequence, Macias could return to school the following day without having missed any work.⁶³

Hobart Middle School is not unique. In fact, 42 percent of K-12 schools and organizations surveyed by CDW-G report that they are “currently implementing some form of cloud computing solution.”⁶⁴

Electronic textbooks are becoming increasingly common and will likewise require high-speed Internet access at home to access their content. The Federal Communications Commission has already challenged the private sector to enable electronic textbooks (and the elimination of printed material) by 2015.⁶⁵ Without adequate broadband at home, students will be unable to access the textbooks required for learning.

“Flipped classrooms” are another emerging educational trend that demand high-speed Internet access for all students. A flipped classroom inverts the traditional structure of a classroom, such that students listen to a pre-recorded lecture *before* class and perform other learning activities in class. This approach uses “educational materials on the Internet as a primary content strategy.”⁶⁶ By exposing students to material before class through videos and podcasts, they are able to attain deeper knowledge during class when they have access to their teachers and can engage collaboratively with their peers.⁶⁷ By reviewing the videos in advance, students enter the classroom more prepared and able to do the more important work alongside their peers and instructors. Classroom time is preserved “to refine mastery with discussions, collaborations with classmates, problem solving, and experimentation.”⁶⁸

⁶³ Carmen McCollum, Sept. 28, 2012, *The Times of Northwest Indiana*, “Middle School Using Cloud Computing for Down-to-Earth Education,” (http://www.nwitimes.com/news/local/lake/hobart/middle-school-using-cloud-computing-for-down-to-earth-education/article_377a141f-b5f7-56e9-b3af-8dd408781e13.html) (accessed Dec. 12, 2013).

⁶⁴ Johnson, L., Adams Becker, S., Cummins, M., Estrada V., Freeman, A., and Ludgate, H. (2013). *NMC Horizon Report: 2013 K-12 Edition*. Austin, Texas: The New Media Consortium, at 16. (<http://www.nmc.org/pdf/2013-horizon-report-k12.pdf>) (accessed Jan 3, 2014)

⁶⁵ “FCC Chairman Genachowski Joins Secretary of Education Duncan to Unveil New ‘Digital Textbook Playbook,’ A Roadmap for Educators to Accelerate the Transition to Digital Textbooks” (http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0201/DOC-312244A1.pdf) (accessed Dec. 15, 2013).

⁶⁶ Johnson, L., Adams Becker, S., Cummins, M., Estrada V., Freeman, A., and Ludgate, H. (2013). *NMC Horizon Report: 2013 K-12 Edition*. Austin, Texas: The New Media Consortium, at 10.

⁶⁷ Ian Bogost, Aug. 2013, *The Atlantic*, “The Condensed Classroom” (<http://www.theatlantic.com/technology/archive/2013/08/the-condensed-classroom/279013/>)

⁶⁸ Johnson, L., Adams Becker, S., Cummins, M., Estrada V., Freeman, A., and Ludgate, H. (2013). *NMC Horizon Report: 2013 K-12 Edition*. Austin, Texas: The New Media Consortium, at 10.

Teachers who have adopted this approach report that it offers “greater control of material and more face time with students.”⁶⁹ Stacey Roshan, a teacher at the Bullis School near Washington, D.C., explains that this approach has allowed her to complete the formal lectures for her AP Calculus course a month in advance, providing extra time for review in the classroom. Because lectures are recorded, students are able to re-watch lessons—replaying confusing sections that “didn’t really sink in” initially. As a result, Roshan reports that the number of students scoring a perfect “5” on the AP exam has risen.⁷⁰ The approach has received considerable support, prompting President Obama to highlight “flipped” classrooms as a component of his plan to make college more affordable.⁷¹

Portland is home to 24 colleges and universities, including Portland Community College, Portland State University, Oregon Health and Science University, University of Portland, Reed College, National College of Natural Medicine, and Lewis and Clark College. Combined, these institutions support 74,120 students along with faculty and staff.⁷² While many of these campuses are connected to the existing middle-mile network, the full benefits that broadband affords will not be realized if students and faculty are not able to retain access when they return to their homes. Only a fraction of Portland students live in university-owned campus housing. The city’s largest university, Portland State University, provides on-campus housing to only 10 percent of its 24,963 students.⁷³ The city’s second-largest educational institution, Portland Community College (with 24,353 students), does not offer any dormitories or on-campus housing.⁷⁴ The vast majority of these students thus live in off-campus apartments, which may provide Internet connectivity, but do not support next generation, high-bandwidth applications. While a larger percentage of students at the smaller, private colleges, like Lewis and Clark, live on campus,⁷⁵ students who live off campus do not have access to the same next-generation connectivity.

⁶⁹ Greg Toppo, Oct. 7, 2011, USA Today, “‘Flipped’ classrooms take advantage of technology” (<http://usatoday30.usatoday.com/news/education/story/2011-10-06/flipped-classrooms-virtual-teaching/50681482/1>).

⁷⁰ Greg Toppo, Oct. 7, 2011, USA Today, “‘Flipped’ classrooms take advantage of technology” (<http://usatoday30.usatoday.com/news/education/story/2011-10-06/flipped-classrooms-virtual-teaching/50681482/1>).

⁷¹ The White House, Aug. 22, 2013, “FACT SHEET on the President’s Plan to Make College More Affordable: A Better Bargain for the Middle Class” (<http://www.whitehouse.gov/the-press-office/2013/08/22/fact-sheet-president-s-plan-make-college-more-affordable-better-bargain->).

⁷² CollegeStats.org, “Colleges and Universities in Oregon” (<http://collegestats.org/colleges/oregon>) (visited Jan. 22, 2014).

⁷³ Su Yim, Sept. 4, 2012, *Portland State Magazine*, “Campus Housing Is Transforming the Student Experience” (<http://www.pdx.edu/news/living-large>) (visited Jan. 22, 2014) (note that this article reports 29,000 matriculated students, compared to 24,353 reported at www.collegestats.org).

⁷⁴ Portland Community College, “Frequently Asked Questions” (<http://www.pcc.edu/programs/zoo-animals/faq.html>) (visited Jan. 22, 2014).

⁷⁵ Lewis and Clark, Student Life (reporting that 70 percent of the college’s 3,562 students live on campus) (http://college.lclark.edu/student_life/) (visited Jan. 22, 2014).

A gigabit Network would also benefit international students at Portland colleges and universities. For instance, Portland State University's student body includes 2,000 students from nearly 100 different countries.⁷⁶ High bandwidth is essential for these students to be able to communicate through video connections with friends and family in their home countries.

FTTH will also benefit Portland Public Schools. With 47,000 students across 81 schools, Portland Public Schools is the largest school district in the Pacific Northwest.⁷⁷ While Portland's Integrated Regional Network Enterprise (IRNE) partnership with Comcast's Institutional Network serves several hundred public buildings in Multnomah County, including libraries, K-12 schools, and local government offices, the network does not extend to student homes. Consequently, students cannot take advantage of next-generation speeds outside their classrooms.

In the City's Broadband Strategic Plan, Portland Public Schools emphasized the importance of providing access for students and their families. PPS utilizes a suite of "online teacher tools that includes a grade book, curriculum planner, data dashboard, collaboration portal, and professional development planner. The online suite is designed to connect teachers to students, teachers to parents, and teachers to teachers in a new and meaningful way via the Internet. "It is just one example of many dependencies schools have on the Internet to improve student outcomes, close the achievement gap, and deliver better learning opportunities for all the students we serve."⁷⁸

9. Gigabit Fiber Networks Enable Environmental Benefits and Cost Savings Through Telecommuting

Portland has been dubbed "Green City," and was named the "greenest city in America" in 2012 by *Travel and Leisure* magazine.⁷⁹ The widespread adoption of gigabit networking may solidify this ranking.

⁷⁶Portland State University, International Student Services (<http://www.pdx.edu/international-students/>) (visited Jan. 22, 2014).

⁷⁷Portland Public Schools, Facts and Figures 2012-2013 (<http://www.pps.k12.or.us/files/about-us/PPS-InfoSheet-2013-V03.pdf>).

⁷⁸City of Portland, Sept. 6, 2011, "Connecting to Our Future: Portland's Broadband Strategic Plan," at 9 (<http://www.oregonbroadbandplanning.org/assets/docs/PDX-Google-Plan.pdf>) (accessed Jan. 22, 2014).

⁷⁹Katrina Brown-Hunt, April 2012, *Travel and Leisure*, "America's Greenest Cities" (<http://www.travelandleisure.com/articles/americas-greenest-cities>); See also Kate Sheppard, July 19, 2007, "15 Green Cities," *Environmental News and Commentary* (listing Portland as one of the 15 greenest cities in the world), <http://grist.org/article/cities3/> (accessed Jan. 21, 2014).

“Universal, affordable, and robust broadband” is a “necessary prerequisite” for telework.⁸⁰ This is often touted as the “most transformative”⁸¹ and “biggest environmental benefit”⁸² of new fiber networks. In market research conducted by CTC in San Francisco, 67 percent of respondents reported that they needed higher speeds than cable modem to telework and 70 percent of respondents indicated that they would telework more if there were sufficient speed. Other studies support this finding. [W]orking from home—either as a telecommuting employee or a home-based entrepreneur—is thus far more feasible with FTTH than with other types of broadband connections.⁸³

Telework confers a wide array of primary and secondary emissions benefits, which will provide significant cost savings to Portland and its residents by reducing vehicle-operating expenses, the amount of time spent traveling, reduced road repairs, reduced traffic congestion, and other factors. In addition with the decrease of mileage driven and gasoline burned, telecommuting benefits the environment and reduces greenhouse gases by lowering auto emissions. Where telework occurs full time, it can reduce construction demand for office space and related electricity use.⁸⁴

There are 294,611 individuals over 16 in the Portland workforce.⁸⁵ Of these, roughly 7.1 percent (20,945 individuals) telecommute and 59.2 percent (174,331) travel to work alone by car.⁸⁶ These individuals commute an average of 24.1 minutes each way.⁸⁷ While shorter than the national average (25.5 minutes),⁸⁸ this nonetheless represents a substantial amount of unproductive time each year for Portland residents. Indeed, Portland telecommuters avoid an average of 48 minutes driving time each day and roughly four hours each week. If the new fiber

⁸⁰ Jonathan Rintel, "An Action Plan for America: Using Technology and Innovation to Address Our Nation's Critical Challenges," The Benton Foundation, Nov. 2008, at 24, http://www.benton.org/initiatives/broadband_benefits/action_plan.

⁸¹ Stephen Ezell et al., "The Need for Speed: The Importance of Next Generation Broadband Networks," Information Technology and Innovation Foundation, March 2009, at 15, <http://www.itif.org/files/2009-needforspeed.pdf>.

⁸² Steven S. Ross and Masha Zager, "Fiber to the Home Is Green Technology," *Broadband Properties*, Jan/ Feb 2009, at 30, http://www.bbpmag.com/2009issues/jan09/GoogleP_JanFeb09_CoverStory.pdf.

⁸³ Broadband Communities, "Fiber to the Home Primer," Fall 2013, www.ftthcouncil.org/FiberPrimer (citing RVA LLC study).

⁸⁴ See, e.g., Joseph Fuhr and Stephen Pociask, "Broadband Services: Economic and Environmental Benefits," The American Consumer Institute, Oct. 31, 2007, at 20 (reporting a \$25 million reduction in national real estate costs) (<http://www.theamericanconsumer.org/2007/10/broadband-services-economic-and-environmental-benefits/>)

⁸⁵ U.S. Census Bureau, American Community Survey 2009-2011, DP03 (Selected Economic Characteristics) (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_3YR_DP03&prodType=table) (accessed Jan. 21, 2014)

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ U.S. Census Bureau, Feb. 2013, "American Community Survey Reports: Out-Of-State and Long Commutes 2011," at 2 (<http://www.census.gov/hhes/commuting/files/2012/ACS-20.pdf>).

network enabled a doubling of telecommuting in Portland (i.e., from 7.1 percent to 13.8 percent), it could conceivably save an additional 61,485 hours for area residents.

This avoided commuting time has a direct economic value. Most time spent commuting is of limited or no productivity. It reduces the amount of time Portland residents can spend with family, work on household projects, or learn new skills. The 2012 Urban Mobility Report values these “alternate” activities at \$16.79 per hour.⁸⁹ Applying this value to Portland, doubling telework in the area would represent in excess of \$1.03 million in annual savings for the 20,495 individuals who would be able to eliminate their commute.

These individuals would also save money on avoided fuel and vehicle costs. The 2012 Urban Mobility Report indicates that in Portland, Oregon, the typical commuter wasted 44 hours, 21 gallons of fuel, and \$937 in 2011.⁹⁰ Since 59.2 percent of Portland’s 174,331 workers travel to work alone by car, allowing an additional 20,495 individuals to work from home would potentially remove 12,133 cars from the road. Applying the Urban Mobility data for Portland, these commuters could collectively save 254,793 gallons of fuel and nearly \$11.4 million.

An increase in telecommuting not only saves times for the residents who are no longer driving to work, but also reduces congestion for the remaining members of the workforce. The 2012 Urban Mobility Report indicates that Portland, Oregon has a “Travel Time Index” of 1.28—the fourth-worst in the nation.⁹¹ Thus, it takes 28 percent longer to reach destinations during peak travel time for Portland commuters. Increasing telework would reduce the number of cars on the road during peak travel times, alleviating congestion. Assuming that 52.5 percent (6,370) of Portland’s 12,133 new teleworkers who previously travelled by private car would have travelled during peak times,⁹² a doubling in telework would lead to a 14 percent reduction in private vehicle use during the morning commute.

10. Gigabit Fiber Networks Support Workforce Participation for Seniors and the Disabled

Seniors represent a sizable and growing percentage of the workforce. According to the U.S. Census and the Bureau of Labor Statistics, 14.8 percent of seniors (ages 65 and up) were working

⁸⁹ David Schrank, Bill Eisele, and Tim Lomax, “The 2012 Urban Mobility Report,” Texas Transportation Institute, Dec. 2012, at 24 (available online at <http://d2dtl5nnlpr0r.cloudfront.net/tti.tamu.edu/documents/mobility-report-2012.pdf>)

⁹⁰ 2012 Urban Mobility Report, Summary Tables, Congestion Levels and Trends, at 25, Table 1 (What Congestion Means to You), <http://d2dtl5nnlpr0r.cloudfront.net/tti.tamu.edu/documents/ums/congestion-data/national/national-table1.pdf>

⁹¹ INTRIX National Traffic Scorecard, 2012 Annual Report Summary Tables, Congestion Levels and Trends (Table 10: Congestion Trends—Wasted Time), <http://d2dtl5nnlpr0r.cloudfront.net/tti.tamu.edu/documents/ums/congestion-data/national/national-table10.pdf>

⁹² See, *supra* note **Error! Bookmark not defined.**, and accompanying text.

⁹³ Robert Litan, “Great Expectations: Potential Economic Benefits to the Nation From Accelerated Broadband

or looking for work in 2005.⁹³ These numbers are projected to increase given the state of the economy, which has affected retirement savings; trends away from defined pension plans; and longer life expectancies, which increase the amount of savings required to sustain a constant quality of life into retirement. According to the Social Security Administration's Actuary Office, delayed retirement is expected to increase the U.S. labor force by one million additional workers by 2030 (1.5 percent by 2080). Several more ambitious analyses by the Urban Institute project an additional 6.2 million workers (4.4 percent by 2040). Assuming that the midpoint of these estimates can "plausibly" be "attributed to broadband technology," Litan projects an increase of roughly 3.6 million workers (roughly 2 percent of the total workforce) by 2030.⁹⁴ Working seniors earned a median income of \$29,000 in 2005. Assuming comparable earnings for the additional members of the workforce, Litan projects additional output gains of \$121.51 billion in 2010 and \$822.40 billion in 2030.⁹⁵

According to the U.S. Census, from 2009-2011 there were 300,197 employed individuals in Portland.⁹⁶ If broadband access were to enable more seniors to stay in the workforce—leading to a 2 percent increase in the overall workforce—Portland would have 6,004 additional employees and, assuming a per capita income of \$30,014,⁹⁷ roughly \$180.2 million in additional annual output.

Likewise, if broadband access were to enable a 1 percent increase in employment among Portland residents with disabilities, the region would see a fairly substantial level of increased economic output. According to the U.S. Census, from 2009-2011, there were 16,102 disabled individuals in the labor force (aged 18 to 64) in Portland, of whom 75.1 percent were working.⁹⁸ Using Litan's assumption that FTTH enabled a 1 percentage point increase in the participation rate of disabled residents implies that roughly 161 additional individuals would join the labor force. Assuming a per capita income of \$30,014,⁹⁹ output would increase by \$4.8 million.

⁹³ Robert Litan, "Great Expectations: Potential Economic Benefits to the Nation From Accelerated Broadband Deployment to Older Americans and Americans with Disabilities," New Millennium Research Council, Dec. 2005, at 24 (available online at http://newmillenniumresearch.org//archive/Litan_FINAL_120805.pdf).

⁹⁴ Litan, *Id.* at 25-26.

⁹⁵ Litan, *Id.* at 28.

⁹⁶ U.S. Census Bureau, American Community Survey 2009-2011, DP03 (Selected Economic Characteristics)(http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_3YR_DP03&prodType=table) (accessed Jan. 21, 2014).

⁹⁷ *Id.*

⁹⁸ U.S. Census Bureau, American Community Survey 2009-2011, B18120 (Employment Status by Disability Status and Type) (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_3YR_B18120&prodType=table) (accessed Jan. 21, 2014).

⁹⁹ U.S. Census Bureau, American Community Survey 2009-2011, DP03 (Selected Economic Characteristics) (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_3YR_DP03&prodType=table) (accessed Jan. 21, 2014).

11. Gigabit Fiber Networks Facilitate “In-Sourcing” of Jobs

Millions of American jobs have been outsourced—or “offshored”—to companies abroad. By some estimates, half of the Fortune 500 companies have exported jobs overseas with projections that an additional 3 million jobs will be sent overseas by 2015.¹⁰⁰ Offshoring provides access to low-cost labor, the ability to continue operations 24-hours a day, and an entry into the global marketplace. At the same time, offshoring limits quality control and may compromise customer relations. This, in turn, has led some to explore ways to retain business in the United States. One mechanism is through the creation of virtual domestic call centers, a practice called “homeshoring.” Broadband is a necessary prerequisite for successful homeshoring.¹⁰¹

Homeshoring offers a range of benefits. Significantly, homeshoring creates opportunities for individuals who would otherwise be excluded from the workforce, since the elderly, disabled, and parents of young children can work as agents from a home office. As a consequence, homeshore agents are often a “higher caliber” than those attracted to a “traditional call center environment.” For instance, one provider reports that the average age of its agents is 38 and 80 percent have received some college education.¹⁰² Companies also benefit from reduced costs, since they do not need to provide security, heat, light or office space.¹⁰³ These savings are significant. In fact, the American Consumer Institute estimates that home-based agents reduce call-center employee costs by more than one-third.¹⁰⁴ Office Depot projects that its domestic call center will result in \$15 million annual savings.¹⁰⁵ Homeshoring even offers savings over offshoring. Indeed, the Telework Coalition asserts that homeshoring can reduce property and IT

¹⁰⁰ Joseph Fuhr and Stephen Pociask, “Broadband Services: Economic and Environmental Benefits,” The American Consumer Institute, Oct. 31, 2007, at 21.

¹⁰¹ See “Sabio Highlights Five Key Factors for Successful Homeshoring,” ContactCenterWorld.com, Nov. 20, 2008 (available online at <http://www.callcentreclinic.com/news/corporate-news/sabio-highlights-five-key-factors-for-successful-homeshoring-23740.htm>) (additional requirements include appropriate technology (i.e., separate broadband and phone connections and a computer that can run an organization’s existing contact center); a culture that supports homeshoring; security; and appropriate office space and a system for monitoring). See also Lori Bocklund, “VoIP Breaks Down the Walls of the Call Center,” Network World, May 10, 2004 (available online at <http://www.networkworld.com/research/2004/0510contact.html>).

¹⁰² Martha Frase-Blunt, “Call Centers Come Home,” HR Magazine, Jan. 2007, at 85 (abstract available online at http://www.emeraldinsight.com/bibliographic_databases.htm?id=1596823&PHPSESSID=fbhri6c88ghn9po58s3tkm) (reporting data for Alpine Access, a Denver-based provider of call center services).

¹⁰³ Tracey E. Schelmetic, “A Victory For The Home Agent Business Model,” TMC News, Jan. 20, 2006 (available online at <http://www.tmcnet.com/news/2006/01/20/1302729.htm>); Theresa Sweeney, “Remote Call Centers,” All Business, Jun. 1, 2006 (abstract available online at <http://www.allbusiness.com/technology/telecommunications-phone-systems-voip/4092765-1.html>).

¹⁰⁴ Joseph Fuhr and Stephen Pociask, “Broadband Services: Economic and Environmental Benefits,” The American Consumer Institute, Oct. 31, 2007, at 22.

¹⁰⁵ Adam Geller, “‘Homeshoring’ means that call center might be in someone’s bedroom,” Seattle-Post Intelligencer, May 9, 2005 (available online at http://www.seattlepi.com/business/223367_homecall09.html).

costs by as much as 80 percent over offshoring.¹⁰⁶ Research also suggests that homeshoring improves employee satisfaction, dramatically improving retention and increasing productivity by 10 to 20 percent.¹⁰⁷

Jet Blue Airlines is one of the best known, and perhaps most successful, homeshoring case studies. The New York-based airline has relied exclusively on home-based agents in its virtual reservation center in Salt Lake City, Utah since the company was launched in 2000. The company employs 1,500 home-based agents, the majority (70 percent) of which are part-time, stay-at-home moms. Although all “crew members” work from a home office in Salt Lake City, they are required to report monthly to a brick-and-mortar reservation center to meet with team supervisors and bimonthly for ongoing training. Unlike many homeshoring models, Jet Blue offers its staff medical coverage and profit sharing as well as flight benefits. The flexibility afforded by the company’s home-based operation allows it to benefit from a demographic that would otherwise be unable to enter the workforce, lowering costs and turnover and improving employee satisfaction.¹⁰⁸

Other companies offer variations on the Jet Blue model. For instance, many home-based models forego face-to-face interactions, allowing employees to complete training online, either through independent programs or real-time interactions with another virtual agent. While some companies follow Jet Blue’s approach of employing specialized agents to work for dedicated clients, others allow agents to complete training for dozens of different clients simultaneously. Many offer a range of employee benefits, including supplemental health benefits and paid training, although others cut costs further by treating agents as contractors, thus saving on health care.¹⁰⁹

These benefits can easily be enabled through FTTH. Agents must also have a quiet room to conduct business, a separate phone-line, and a personal computer (which may or may not be

¹⁰⁶ Martha Frase-Blunt, “Call Centers Come Home,” *HR Magazine*, Jan. 2007, at 84 (abstract available online at http://www.emeraldinsight.com/bibliographic_databases.htm?id=1596823&PHPSESSID=fbhri6c88ghn9po58s3tkmts6)

¹⁰⁷ “Sabio Highlights Five Key Factors for Successful Homeshoring,” *ContactCenterWorld.com*, Nov. 20, 2008 (available online at <http://www.contactcenterworld.com/view/contact-center-news/Sabio-Highlights-Five-Key-Factors-For-Successful-Homeshoring.asp>); Joseph Fuhr and Stephen Pociask, “Broadband Services: Economic and Environmental Benefits,” *The American Consumer Institute*, Oct. 31, 2007, at 22 (reporting employee retention of 85 percent, compared to 10 to 20 percent at a traditional call center).

¹⁰⁸ Martha Frase-Blunt, “Call Centers Come Home” *HR Magazine*, Jan 2007, at 84-89; Peter Davy, “The Home Connection,” *Charity Times*, June 2008, http://www.charitytimes.com/pages/ct_features/june08/articles/ct_june08_feature1_the_home_connection.htm
For more on Jet Blue’s experience, see NPR story at <http://www.npr.org/templates/story/story.php?storyId=5187431>.

¹⁰⁹ Martha Frase-Blunt, “Call Centers Come Home,” *HR Magazine*, Jan. 2007 at 84, http://www.charitytimes.com/pages/ct_features/june08/articles/ct_june08_feature1_the_home_connection.htm (describing each of these models).

provided by the employer). The “host” corporation can use its existing Voice over Internet Protocol (VoIP) technology to monitor performance. Agents can interact with one another in online chat rooms set up by the parent corporation, creating a “virtual watercooler.”

Like many cities, Portland could conceivably entice a company to establish a virtual call center if it had FTTH and the right mix of other attributes (e.g., attractive tax rates, workforce availability, suitable office space for training or meeting centers). In fact, Virginia’s Bristol Virginia Utilities (BVU) fiber network led one of the network’s competitors (DirecTV) to create a virtual call center employing 100 operators in the community. This decision could not have been made absent the “robust and reliable connectivity” afforded by BVU’s fiber.¹¹⁰

With its highly educated population, Portland may have an advantage over some other urban areas; Portland residents are 50 percent more likely to have earned a bachelor’s degree or higher than the U.S. population as a whole.¹¹¹ Moreover, the large student population might provide a workforce with flexible hours, which is well-suited to such employment. The city’s location in the Pacific time zone could also be a benefit. Call center employees working a standard day, for example, could provide coverage of “evening hours” for customers phoning from the East Coast, as well as regular business hours for the West Coast.

12. Gigabit Fiber Networks Offer Health Care Benefits

High-speed broadband technology can dramatically reduce health care expenses by providing the tools to remotely monitor patients, allow collaboration between medical professionals, facilitate the transfer of medical data and images, and increase access to emergency services in

¹¹⁰ Christopher Mitchell, April 2012, Institute for Local Self Reliance, “Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks,” at 15 (available online at <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>).

¹¹¹ *Compare* U.S. Census Bureau, American Community Survey 2008-2012, DP02 (Selected Social Characteristics in the United States) (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_5YR_DP02) (reporting that 43.1 percent of Portland residents have a bachelor’s degree or higher) with http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_5YR_DP02 (reporting 28.5 percent of the United States population has attained a bachelor’s degree or higher).

remote areas.¹¹² By one estimate, these services can lead to savings of \$165 billion per year.¹¹³ “Always-on broadband” is “essential” for some of these applications and greatly improves others that “depend on uninterrupted real-time transmission.”¹¹⁴

Telehealth holds particular promise for remote monitoring of chronic conditions. Nearly half of Americans (45 percent or 130 million people) suffer from at least one chronic condition, such as arthritis, asthma, cancer, depression, diabetes, heart disease, and obesity. Combined, treatment of these conditions accounts for 75 percent of health care spending—\$1.7 trillion annually.¹¹⁵ Despite this enormous expense, most Americans with chronic conditions suffer from inadequate treatment. For instance, according to the National Center for Policy Analysis, less than one-fourth of patients with high blood pressure control it adequately. Twenty percent of patients with Type-1 diabetes fail to see a doctor annually, with 40 percent of diabetics failing to regularly monitor their blood sugar level or receive recommended annual retinal exams.¹¹⁶ Inadequate monitoring can have deadly consequences: chronic illness accounts for 70 percent of deaths in the United States.¹¹⁷

¹¹² Jonathan Rintels, “An Action Plan for America: Using Technology and Innovation to Address Our Nation’s Critical Challenges,” The Benton Foundation, 2008, at 15 (available online at http://www.benton.org/initiatives/broadband_benefits/action_plan) (broadband can “revolutionize medical treatment”); *see also* Carlton Doty, “Delivering Care Anytime, Anywhere; Telehealth Alters the Medical Ecosystem.” Forrester Research for the California Healthcare Foundation, Nov. 2008; Telemedicine Association of Oregon, “Benefits of Telemedicine,” Jan. 16, 2004 (available online at <http://www.jirwinconsulting.com/Benefits%20of%20Telemedicine.pdf>).

¹¹³ Jonathan Rintels, “An Action Plan for America: Using Technology and Innovation to Address Our Nation’s Critical Challenges,” The Benton Foundation, 2008, at 15 (available online at http://www.benton.org/initiatives/broadband_benefits/action_plan).

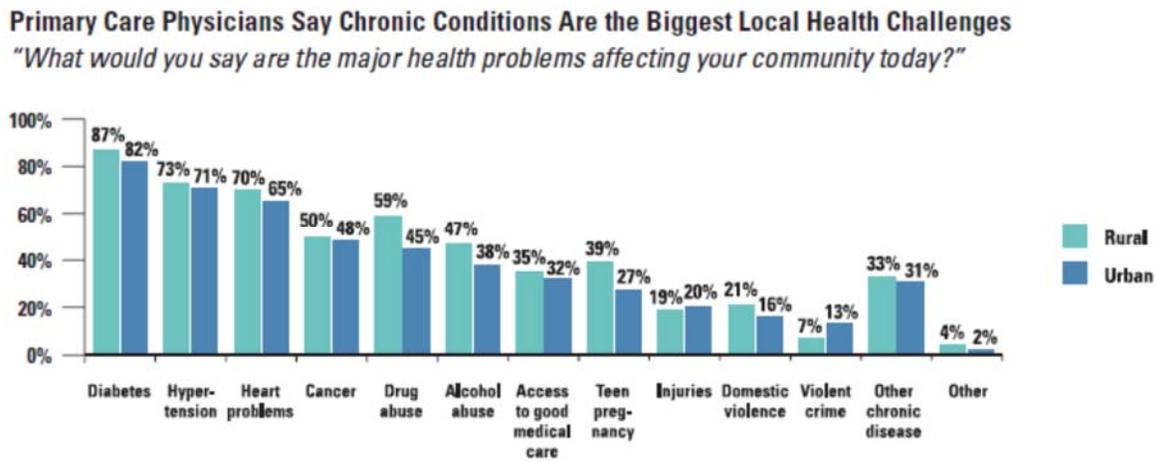
¹¹⁴ Alexander H. Vo, “The Telehealth Promise: Better Health Care and Cost Savings for the 21st Century,” University of Texas Medical Branch, May 2008, at 13 (<http://telehealth.utmb.edu/presentations/The%20Telehealth%20Promise-Better%20Health%20Care%20and%20Cost%20Savings%20for%20the%2021st%20Century.pdf>).

¹¹⁵ Partnership to Fight Chronic Disease, 2009 Almanac of Chronic Disease, at 4 (available online at http://www.fightchronicdisease.org/sites/fightchronicdisease.org/files/docs/2009AlmanacofChronicDisease_updated81009.pdf).

¹¹⁶ Devon Herrick, Convenient Care and Telemedicine, National Center for Policy Analysis, NCPA Policy Report No. 305 (ISBN #1-56808-179-0), Nov. 2007, at 8 (available online at http://heartland.org/sites/all/modules/custom/heartland_migration/files/pdfs/22678.pdf).

¹¹⁷ Jeffrey Harris & Robert Wallace, Sept. 20, 2012, Preventing Chronic Disease, “The Institute of Medicine’s New Report on Living Well with Chronic Illness,” vol. 9 (<http://dx.doi.org/10.5888/pcd9.120126>).

Figure 1: Physicians Believe Chronic Conditions Are Among their Biggest Health Challenges¹¹⁸



A large majority (64 percent) of those with chronic medical conditions have Internet access, and 53 percent of adults suffering from chronic conditions have already looked online for health information.¹¹⁹ Through remote monitoring, these connected Americans can manage and address their chronic illness at dramatically lower cost. In fact, both the Benton Foundation and the University of Texas estimate that remote monitoring could lower hospital, drug and outpatient costs by 30 percent, reducing the length of hospital stays from 14.8 days to 10.9 days, office visits by 10 percent, home visits by 65 percent, emergency room visits by 40 percent, and hospital admissions by 63 percent.¹²⁰

Examples of successful telemedicine programs for chronic diseases abound:

- A one-year study of 15 subjects with type 1 diabetes demonstrated significant improvements for patients using an insulin pump and a real-time continuous glucose monitoring system. Participants had three in-person medical visits and uploaded data daily. At the conclusion of the study, participants reported a significant improvement in quality of life and satisfaction with treatment.¹²¹

¹¹⁸ UnitedHealth Center for Health Reform & Modernization, July 2011, "Modernizing Rural Health Care" [Working Paper 6], at 9 http://www.unitedhealthgroup.com/hrm/UNH_WorkingPaper6.pdf

¹¹⁹ Susannah Fox, April 23, 2013, Pew Internet Health (<http://www.pewinternet.org/Commentary/2011/November/Pew-Internet-Health.aspx>).

¹²⁰ Jonathan Rintels, "An Action Plan for America: Using Technology and Innovation to Address Our Nation's Critical Challenges," The Benton Foundation, Nov. 2008, at 16 (http://www.benton.org/initiatives/broadband_benefits/action_plan).

¹²¹ Inmaculada González-Molero, et al., Sept. 2012, Journal of Telemedicine Telecare, "Use of telemedicine in subjects with type 1 diabetes equipped with an insulin pump and real-time continuous glucose monitoring," at 328-332.

- In a telemedicine-based care model for treatment of Parkinson’s disease, 78 patients sent frequent video recordings (about three per day) from their homes to the treating team via the Internet. The videos were used to inform therapeutic decisions, including drug adjustments. At the conclusion of the month, the participants demonstrated significantly less impairment on a standard scale.¹²²
- A study of patients discharged with congestive heart failure and chronic obstructive pulmonary disease found that remote monitoring reduced hospital readmission rates by over 60 percent.¹²³

Remote monitoring is especially helpful for the elderly, since approximately 84 percent of adults who are aged 65 or older suffer from at least one chronic condition.¹²⁴ In the event that these individuals are eventually transferred to a nursing home, telemedicine continues to provide benefits by supplementing limited staff. The New England Health Institute reports that nursing home physicians spend on average less than two hours per week on site. Extended eVisit technologies allows for “around-the-clock” audio and videoconferencing consultations for nursing home residents who are unable to meet directly with their physicians. These technologies can already benefit the 1.5 million Americans living in nursing homes. As the baby boomer generation ages, demands on limited nursing staff will only increase, providing greater need for remote monitoring technology.¹²⁵

Chronic illnesses affect a significant number of people in Portland. To the extent that high-speed broadband can enable remote monitoring of chronically ill residents, FTTH in Portland could significantly reduce the costs of managing and treating these conditions. As Table 2 illustrates, data from the Centers for Disease Control suggest that chronic disease impacts a large number of the area’s resident adults; remote monitoring would allow for better treatment and reduced medical costs for these individuals.

¹²² Frank Marzinzik et al, Evaluation of a telemedical care programme for patients with Parkinson’s disease *J Telemed Telecare* September 2012 18: 322-327 (reporting a decline in impairment from 31 points at enrolment to 24 points three months after termination of the experiment).

¹²³ Fierce Mobile Healthcare, April 15, 2013, “Remote Care Management Program to Be Rolled Out Nationwide” (<http://www.fiercemobilehealthcare.com/story/remote-care-management-program-be-rolled-out-nationwide/2013-04-15#ixzz2RNgtWgYx>).

¹²⁴ Amanda Hall, Michael Stellefson, and Jay Bernhardt, Prev. Chronic Dis. 2012, Healthy Aging 2.0: The Potential of New Media and Technology, 9 (http://www.cdc.gov/pcd/issues/2012/11_0241.htm)

¹²⁵ Erin Bartolini & Nicholas McNeill, New England Health Institute, June 2012, “Getting to Value: Eleven Chronic Disease Technologies to Watch,” at 7-9 (http://www.nehi.net/publications/72/getting_to_value_eleven_chronic_disease_technologies_to_watch).

Table 2: Age-Adjusted Incidence of Chronic Disease in Portland

Chronic Disease	Percent of Population ¹²⁶	Affected Individuals (>18) ¹²⁷
Arthritis	26%	122,786
Diabetes	7%	33,058
High Cholesterol	38%	179,456
High Blood Pressure	27%	127,508

Asthma affects a large number of Oregon residents. In fact, the Oregon Health Authority reports that in 2011, Oregon was among the top six states in terms of incidence of asthma nationwide.¹²⁸ Statewide, an estimated 10.8 percent of adults and 7.8 percent of children have asthma. This means that more than 320,000 adults and 67,000 children in Oregon have asthma.¹²⁹ Assuming a similar incidence rate in Portland, 8,699 Portland children and 51,003 Portland adults suffer from asthma. Statewide, the total cost of asthma hospitalizations in 2011 was more than \$28 million, with an average of over \$14,000 per hospitalization. Fifteen percent of Oregonians live in Portland. Assuming asthma is evenly distributed throughout the state, this suggests that annual asthma-related hospitalization costs in Portland are \$4.2 million (15 percent x \$28 million). Applying Litan’s analysis, telemedicine could reduce hospitalization costs by 30 percent¹³⁰—saving \$1.3 million for Portland residents with asthma.

There are 11 hospitals in Portland Oregon, including five that earned “top ranking” by U.S. News and World Report.¹³¹ These include Oregon Health and Science University, Legacy Good Samaritan Hospital and Health Center, Providence Portland Medical Center, Providence St. Vincent Medical Center, and Legacy Emanuel Hospital and Health Center. Cumulatively, these five hospitals contain 2,156 beds and report 108,754 admissions, including 227,162 emergency room visits. (See Table 3.)

¹²⁶ Centers for Disease Control, 2008, Oregon: Burden of Chronic Diseases(2007 data) (<http://www.cdc.gov/chronicdisease/states/pdf/oregon.pdf>) (retrieved Jan. 22, 2014).

¹²⁷ Data is limited to Portland adults (> 18). According to the U.S. Census, in 2010, there were 583,776 individuals in Portland. 472,253 (80.9 percent) of these individuals were over 18.

¹²⁸ Oregon Asthma Program, Aug. 2013, The Burden of Asthma in Oregon: 2013, at 1 (http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/Asthma/Documents/burden/or_asthma2013.pdf) (retrieved Jan. 22, 2014).

¹²⁹ *Id.*

¹³⁰ Robert Litan, “Great Expectations: Potential Economic Benefits to the Nation From Accelerated Broadband Deployment to Older Americans and Americans with Disabilities,” New Millennium Research Council, Dec. 2005, at 16-17 (available online at http://newmillenniumresearch.org/archive/Litan_FINAL_120805.pdf).

¹³¹ U.S. News and World Report, Best Hospitals Guidebook (http://health.usnews.com/best-hospitals/search?hospital_name=&city=Portland%2C+OR&distance=25) (visited Jan. 21, 2014).

Table 3: Portland Hospital Statistics

Hospital Name	Number of Beds	Admissions	Emergency Room Visits	Inpatient Surgeries	Outpatient Surgeries
Oregon Health and Science University	537	28,686	46,070	15,042	14,486
Legacy Good Samaritan Hospital & Health Center	249	11,315	30,467	38,818	10,621
Providence Portland Medical Center	412	21,699	66,400	7,240	23,616
Providence St. Vincent Medical Center	552	28,617	84,225	7,808	24,267
Legacy Emanuel Hospital & Health Center	406	18,437	N/A	N/A	N/A
TOTAL	2,156	108,754	227,162	68,908	72,990

These hospitals are connected to broadband but many of their patients and employees do not have high-speed broadband in their homes. This limits the ability of doctors to interact with staff once they return home. It also prevents patients from receiving remote care, leading to unnecessary hospital visits.

13. Gigabit Fiber Networks Offer Aging in Place and Other Supports for Seniors

High-speed broadband promises a range of applications that can benefit an aging population. In particular, broadband access can lower medical costs and prevent hospitalization through home-based monitoring; extend employment opportunities through telework; and foster ongoing relationships by allowing homebound seniors to connect to the outside world.¹³²

Portland institutions have already taken steps to achieve benefits like these: Oregon Health Science University's Oregon Center for Aging and Technology launched a landmark NIH-supported community study deploying in-home technologies to detect the earliest phases of cognitive decline in healthy seniors.¹³³

These benefits translate to dramatic savings in Medicaid and Medicare expenses for the federal and state government, reduced demand for limited space in Portland hospitals and long-term care facilities, and increased income and savings for Portland residents.

¹³² Richard Adler, "Older Americans, Broadband and the Future of the Net," Senior Net, 2006 (available online at <http://www.seniornet.org/research/SeniorNetNNPaper060606.pdf>).

¹³³ <http://www.ohsu.edu/xd/research/centers-institutes/neurology/alzheimers/about/orcatech.cfm>

Seniors are more likely to seek health information online if they have a dependable, high-speed broadband connection. Such access empowers seniors by allowing them “to be preemptive and interactive in their efforts to combat the harmful effects of aging.”¹³⁴ It also translates to reduced medical expenses. In fact, Kaiser Permanente found that allowing enrollees (of all ages) to email questions to their doctor through a secure messaging system led to a 7 to 10 percent reduction in primary care visits.¹³⁵

CTC’s market research in other jurisdictions has found that computer ownership among seniors lags substantially behind the rest of the population. In Seattle, for instance, only 69 percent of area seniors reported owning a computer, while 89 percent of respondents overall reported computer ownership. Because fewer seniors own computers, an aggressive program to promote computer ownership (and broadband use) among seniors will have to be implemented to ensure broadband adoption in this cohort. If such a program were not initiated, then the benefits of high-speed broadband access would have to await the aging of younger, more computer-savvy Portland residents. In 2010, 10.4 percent of Portland’s population (60,789) was older than 65.¹³⁶ Pew Internet and American Life suggests that 32,218 (53 percent) of these seniors are online, and thus potential beneficiaries of FTTH.

Medical monitoring enabled by high-speed broadband may also delay and potentially eliminate the need for institutionalized living, with dramatic savings. As of 2002, 5 percent of Medicare-eligible seniors (1.6 million) lived in nursing homes.¹³⁷ This number is expected to increase as baby boomers retire and life-span increases. In fact, 44 percent of seniors will live in nursing homes at some point during their lifetime.¹³⁸ This care comes at a significant cost. In 2004, the federal government spent \$135 billion on long-term care for the elderly.¹³⁹ Nationally, the annual cost is more than \$87,235 (\$239 per day) for a private room in a nursing home.¹⁴⁰

¹³⁴ Charles Davidson and Michael Santorelli, “The Impact of Broadband on Senior Citizens,” U.S. Chamber of Commerce, Dec. 2008, at 21 (available online at http://www.uschamber.com/sites/default/files/about/BroadbandandSeniors_0.pdf).

¹³⁵ Devon Herrick, Convenient Care and Telemedicine, National Center for Policy Analysis, NCPA Policy Report No. 305 (ISBN #1-56808-179-0), Nov. 2007, at 14 (available online at http://heartland.org/sites/all/modules/custom/heartland_migration/files/pdfs/22678.pdf).

¹³⁶ U.S. Census Bureau, 2012 American Community Survey, S0101 (Age and Sex) (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_1YR_S0101&prodType=table).

¹³⁷ Litan, *Id.* at 21.

¹³⁸ Litan, *Id.* at 21. *See also* Charles Davidson and Michael Santorelli, “The Impact of Broadband on Senior Citizens,” U.S. Chamber of Commerce, Dec. 2008, at 22-23 (available online at http://www.uschamber.com/sites/default/files/about/BroadbandandSeniors_0.pdf). (Projecting 69 percent of seniors will need eventual long-term care.)

¹³⁹ Litan, *Id.* at 21. This includes \$92 billion (68 percent) for nursing home care and \$43 billion (32 percent) on home care.

¹⁴⁰ NPR, Marilyn Geewax, May 1, 2012, “Discovering the True Cost of At-Home Caregiving” (reporting average hourly cost for home care of \$21) (<http://www.npr.org/2012/05/01/151472617/discovering-the-true-cost-of-at-home-caregiving>) (accessed Dec. 12, 2013).

At \$253 per day (\$92,345 annually) for a private room, nursing home costs in Portland are slightly higher than the national average (\$239 per day).¹⁴¹ Given that the average length of a nursing home stay is more than two years (835 days),¹⁴² the total cost of the stay in Portland would be around \$211,255.

Assuming that 44 percent of Portland's senior citizens (whom total 60,789 according to the latest census¹⁴³) will live in nursing homes for that length of time, they will collectively pay more than \$5.7 billion for long-term care. If at-home broadband-enabled health monitoring were able to reduce the average resident's length of stay in a nursing home by even six months, Portland seniors would save more than \$1.2 billion in nursing-home fees. The normalized annual savings is a function of turnover of the seniors living in a nursing home.

Admittedly, the savings in nursing-home expenses would be somewhat offset by the cost of additional at-home health care, but those fees are a small fraction of the daily cost of nursing-home care. Nationally, private at-home care is \$21 per hour.¹⁴⁴ With high-speed broadband in the homes of patients, medical monitoring could make it possible to need as little as one hour every day of in-home care.

14. Conclusion

Construction of a next-generation, gigabit-capable communications network in Portland will create a range of benefits—from economic development, improved educational achievement, and expanded workforce opportunities to advances in healthcare and support for aging-in-place. By delivering truly high-speed, abundant, unconstrained fiber connectivity, this infrastructure holds the promise of expanding on existing innovations and acting as a springboard for innovations that we cannot yet imagine.

¹⁴¹ SeniorHomes.com, "Nursing Home Costs By State" (2011 data) (<http://www.seniorhomes.com/p/nursing-home-cost/>) (accessed Jan. 22, 2014).

¹⁴² Emily Mullin, Feb. 26, 2013, U.S. News and World Report, "How to Pay for Nursing Home Costs," at (citing National Nursing Home Survey) (<http://health.usnews.com/health-news/best-nursing-homes/articles/2013/02/26/how-to-pay-for-nursing-home-costs>) (visited Jan. 22, 2014).

¹⁴³ U.S. Census Bureau, 2010 Census (DP-1 Profile of General Population and Housing Characteristics) (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1).

¹⁴⁴ NPR