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GOVERNMENT SUPPORT FOR INFORMATION INFRASTRUCTURE: AN OVERVIEW

By Shawn Powers

The US government has a long history of providing support for building the nation's information infrastructure. Throughout its history, the United States has faced significant challenges in connecting its vast, diverse and growing nation. In its earliest days, the republic subsidized the delivery of newspapers by having the Postal Service deliver them for a fraction of the postal rate for letters. In the 1800s, the federal government partnered with private industry to build the first transcontinental railroad. Beginning in the 1930s, the Rural Electrification Administration (REA) and its successor agency, the Rural Utilities Service (RUS), financed hundreds of locally owned utility cooperatives, enabling them to bring electric power and telephone service to rural America. The next generation witnessed the federal government work with the states to build the interstate highway system. Federal agencies also cooperated with scientists and universities, first to seed the Internet and later to develop its first backbone. At their inceptions, some of these projects were controversial. Many considered them too expensive; others doubted their efficacy. Today, few would question their value.

Indeed, at the birth of the nation, news — then in the form of newspapers, delivered via the postal service — was seen as vital to the American democratic experiment. As Founding Father Benjamin Rush wrote in 1787, “[f]or the purpose of diffusing knowledge, as well as extending the living principle of government to every part of the United States — every state — city — county — village — and township in the union, should be tied together by means of the post-office...It should be a constant injunction to the postmasters, to convey newspapers free of all charge for postage. They are not only the vehicles of knowledge and intelligence, but the sentinels of the liberties of our country.”^{xi} President George Washington agreed with Rush's sentiments and signed into law the Post Office Act of 1792, which not only established the U.S. Postal Service, but also heavily subsidized newspaper delivery and exchange. In less than fifty years, this “prescient national vision had created the greatest postal system and news network in the world.”^{xii}

The importance of the Government's commitment to rural electrification is of particular note as well. In 1936, electricity reached only 11.6 percent of farms in the U.S. After the Great Depression, private investment had dried up and the few entrepreneurs that were left had deemed rural electrification unprofitable. As a result, President Franklin Roosevelt enacted the Rural Electrification Act, which envisioned the creation of a nationwide electric power generation, transmission and distribution network through federal low interest rate loans and loan guarantees. The REA was so successful that, in 1949, it led Congress to expand the REA's mission to include the financing of rural telephone networks. “People in rural areas would not have adequate, dependable, or urban-quality telephone service without federal government initiative and support.”^{xiii} A robust electrical and telephony infrastructure was essential for the stable growth the United States experience throughout the 20th century and laid the bedrock for the emergence of the digital age.

Of course, the Internet itself was also created under the direct auspices of government support. In response to the Soviet's launching of Sputnik in 1957, President Eisenhower started the Advanced Research Projects Agency (ARPA, renamed the Defense Advanced Research Projects Agency (DARPA) in 1972). About a decade later, DARPA created ARPANet to link university computers, which established a network for communication among research centers. DARPA was in charge of the backbone: it designed and implemented the network, leased the dedicated data lines, and financed the construction and implementation of the interface message processor. ARPANet was the first incarnation of what we now call the Internet. Later, in 1986, the National Science Foundation's NSFNet became the *de facto* backbone of the Internet that connected every campus in America.^{iv}

Whereas early governmental support was about helping media organizations distribute their product, the cost of distribution is now approaching zero. According to Kinsey Wilson, the senior vice president of digital media at National Public Radio: "The role for public media is to remove barriers and to ensure that information flows freely, allowing people to communicate easily with one another, to ensure that there are standards around the interchange of information. It's more of an enabling capacity, perhaps, than a convening capacity."^v

Today, the Internet is global and depends on the fast and efficient distribution of data. Data transmission over fiber-optic cables — in short, broadband — has become the critical variable to gauge the import and impact of the Internet in the industrialized world.

BROADBAND

"Internet access and quality journalism represent the two central public goods that a modern democratic society must have to function effectively. We need news and information to fill and guide a marketplace of ideas for an informed citizenry. And we need universal access to a communications network to participate in that marketplace as both audience and speaker."

-- Free Press, May 2009.

Broadband Internet access is rapidly transforming the way we communicate, work, learn, and play. Touch-screen mobile devices, e-books, and Voice over Internet Protocol (VoIP) have become standard features in many people's daily lives. As broadband speeds have increased, we use the Internet to complete our education, receive medical care, communicate with our government, including on matters of public health and safety, run Web-based businesses, and do our work. Whereas the dial-up Internet of the past was sufficient for many to simply communicate with friends and family over the Internet, today's web requires much faster speeds of data transmission in order to be able to utilize many of its functions. In addition, we not only surf the Web, send e-mail, form social networks, and download music and video, but also become ourselves creators of web-based content as we blog or tweet about local or world events, and become publishers in our own right. Importantly, as more and more use the Internet to communicate, create and purchase, so have governments, institutions and corporations. As a result, those without access to broadband are quickly being left behind: "We must consider the near-universal consensus in the policy world that broadband is fast becoming the 21st century's essential infrastructure. It is the central nervous

system of our economy, society and government.”^{vi} Everyone gains from a universal broadband network, even those who already have access to high-speed Internet. Remember Metcalfe's law: The value of a network is proportional to the square of the number of endpoints. Even if you are already connected, you gain by having the network you are connected to become universal.

According to the FCC's 2009 report on the status of America's broadband infrastructure, “rural communities have long been unserved or underserved by broadband technology. The Obama administration and Congress recognize that broadband access will benefit all Americans in much the same way that the nation as a whole benefited from our past successes in overcoming infrastructure challenges. Bringing ubiquitous and affordable broadband services to rural America will improve the quality of education, healthcare and public safety in rural America, among other benefits. On a larger scale, ensuring that all Americans, including those in rural areas, have access to such services will help to improve America's economy, its ability to compete internationally, and its unity as a nation.”^{vii}

Yet, America's broadband infrastructure is not simply weak in rural communities. In 2000, the United States ranked 5th in terms of broadband penetration. By 2007 it had dropped to 22nd place. Today, around only 60 percent of Americans have broadband internet, while over 90 percent of Internet subscribers in Senegal, Chile and Turkey have broadband.^{viii} Consumers in countries that maintained the commitment to competition, such as South Korea and Japan, are today able to access broadband with speeds reaching 1 Gigabit per second (Gbps) for less than the monthly price a U.S. consumer would pay for service that's 100 times slower. The commitment to competition in countries like Great Britain has led to the development of robust and fiercely competitive marketplaces (See Figure 1).

Figure 1: The Decline in U.S. Broadband Penetration

(Broadband Lines per 100 inhabitants, ITU, 2000 and 2007)

Country	Broadband Penetration (ITU, 2000)	Broadband Penetration Ranking (ITU, 2000)	Country	Broadband Penetration (ITU, 2007)	Broadband Penetration Ranking (ITU, 2007)
South Korea	8.42	1	Bermuda	36.71	1
Hong Kong, China	6.67	2	Denmark	36.33	2
Canada	4.58	3	Iceland	34.76	3
Sweden	2.8	4	Netherlands	33.54	4
United States	2.51	5	Finland	33.33	5
Austria	2.38	6	Switzerland	32.07	6
Singapore	1.89	7	South Korea	30.62	7
Netherlands	1.63	8	Norway	30.57	8
Belgium	1.4	9	Hong Kong, China	26.09	9
Denmark	1.26	10	Belgium	25.97	10
Taiwan, China	1.03	11	Sweden	25.87	11
Macao, China	0.86	12	United Kingdom	25.55	12
Iceland	0.84	13	France	25.22	13
Switzerland	0.78	14	Luxembourg	24.16	14
Finland	0.68	15	Germany	23.97	15
Japan	0.67	16	Australia	23.28	16
Norway	0.52	17	Macao, China	22.97	17
Malta	0.42	18	Canada	22.91	18
France	0.33	19	New Zealand	22.50	19
Germany	0.32	20	Japan	22.47	20
Portugal	0.25	21	Israel	22.06	21
Italy	0.2	22	United States	21.46	22
Spain	0.19	23	Faroe Islands	21.35	23
New Zealand	0.12	24	Taiwan, China	20.93	24
Dominica	0.11	25	Estonia	20.80	25

Source: International Telecommunications Union

Today, Americans pay more per month for broadband than consumers in all but seven of the 30 nations in the Organization for Economic Co-operation and Development (OECD). Overall, America ranks 14th in average advertised download speed, at just under 9 Mbps, some 10 times slower than the international leader Japan. When price and speed are considered together as a measure of value, we see that Americans pay more per megabit per second (Mbps) than consumers in many other countries. The value of U.S. connections is some four times less than that of countries like France, and is only slightly better than the value of connections in Hungary, a country with a per-capita GDP nearly two-and-a-half times lower than the United States (See Figure 2).

Figure 2: Price, Speed and Value of Broadband Connections

(OECD, October 2007)

PRICE (OECD 2007)			SPEED (OECD 2007)			VALUE (OECD 2007)		
Country	Average Advertised Monthly Price (US\$/mo.)	Advertised \$/Mbps Ranking	Country	Average Advertised Download Speed (Mbps)	Advertised Speed Ranking	Country	Average Advertised Price Per Mbps (US\$/mo./Mbps)	Advertised \$/Mbps Ranking
Finland	\$31.18	1	Japan	93.7	1	Japan	\$3.09	1
Germany	\$32.22	2	France	44.2	2	France	\$3.70	2
Switzerland	\$32.69	3	South Korea	43.3	3	Italy	\$4.61	3
United Kingdom	\$33.34	4	Sweden	21.4	4	United Kingdom	\$5.29	4
Sweden	\$34.00	5	New Zealand	13.6	5	South Korea	\$5.96	5
Japan	\$34.21	6	Italy	13.1	6	Luxembourg	\$7.31	6
Denmark	\$34.34	7	Finland	13.0	7	Switzerland	\$8.17	7
France	\$36.70	8	Portugal	13.0	8	Germany	\$8.44	8
Netherlands	\$39.06	9	Australia	12.1	9	Norway	\$9.81	9
Ireland	\$40.41	10	Norway	11.8	10	Portugal	\$11.52	10
South Korea	\$40.65	11	Luxembourg	10.7	11	United States	\$12.60	11
Italy	\$41.09	12	United Kingdom	10.6	12	Finland	\$13.45	12
Greece	\$41.77	13	Germany	9.2	13	Hungary	\$14.31	13
Belgium	\$46.08	14	United States	8.9	14	Ireland	\$14.92	14
New Zealand	\$48.66	15	Canada	7.8	15	Netherlands	\$15.26	15
Turkey	\$50.04	16	Spain	6.9	16	New Zealand	\$16.75	16
Austria	\$50.08	17	Greece	6.6	17	Czech Republic	\$17.54	17
Luxembourg	\$50.84	18	Hungary	6.4	18	Austria	\$17.66	18
Canada	\$51.07	19	Belgium	6.3	19	Denmark	\$17.70	19
Australia	\$52.26	20	Czech Republic	6.0	20	Sweden	\$18.40	20
Portugal	\$52.61	21	Denmark	6.0	21	Belgium	\$18.55	21
United States	\$53.06	22	Switzerland	5.5	22	Slovak Republic	\$19.59	22
Norway	\$55.74	23	Netherlands	5.3	23	Australia	\$21.34	23
Poland	\$56.57	24	Slovak Republic	5.2	24	Iceland	\$22.22	24
Hungary	\$57.22	25	Austria	4.9	25	Spain	\$22.85	25
Iceland	\$57.92	26	Iceland	4.9	26	Poland	\$25.03	26
Mexico	\$72.20	27	Poland	4.2	27	Canada	\$28.14	27
Slovak Republic	\$79.61	28	Ireland	3.0	28	Greece	\$29.13	28
Czech Republic	\$88.91	29	Mexico	1.7	29	Mexico	\$63.89	29
Spain	n/a	n/a	Turkey	1.4	30	Turkey	\$97.43	30

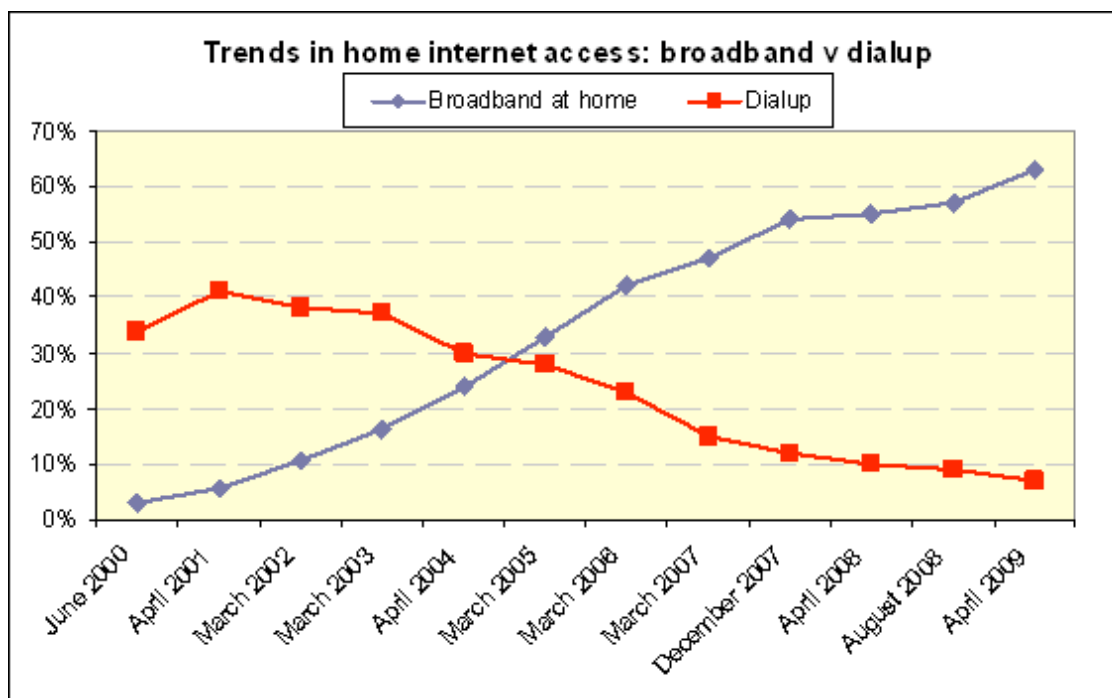
Source: OECD

In order to remedy the decline in the nation's broadband infrastructure, Congress passed the American Recovery and Reinvestment Act of 2009, also known as the stimulus package, which appropriated \$7.2 billion for broadband grants, loans, and loan guarantees to be administered by the USDA's Rural Utilities Service (RUS) and the Department of Commerce's National Telecommunications and Information Administration (NTIA). Importantly, according to Chairman of the FCC Michael Copps, "Congress recognized that this funding initiative, though substantial, was still just a down payment on the broadband needs of the country," adding, "the Recovery Act charges this Commission with developing a national broadband plan by next February to ensure that every American has access to broadband capability and establishing clear milestones for reaching this goal."^{ix}

In addition to the support offered in the stimulus package, the Obama administration has also made clear its interest in facilitating “affordable, value-laden broadband services for all Americans.”^{xv} Through an interagency working group under the auspices of the National Economic Council, the Administration has brought together representatives from a broad cross-section of federal agencies, including the FCC, to coordinate implementation of the nation’s broadband agenda. This working group provides a forum for expert staff from different federal agencies to meet, discuss, and harmonize various federal broadband programs and policies, and identify areas for early action. According to former FCC Chairman Copps, “working together across the federal government and building on the interagency working group’s efforts, we view the separate mandates from Congress as an unparalleled opportunity to ensure that the promise of universal access to broadband services is realized for all Americans.”^{xvi}

A recent survey conducted by the Pew Research Center found that broadband adoption rose to 63 percent of adult Americans, up from 55 percent in May 2008. The greatest growth in broadband adoption in the past year took place among population subgroups that have below average usage rates, including: senior citizens, low-income groups, high-school graduates, older baby-boomers and rural Americans (See Figure 3 for details).^{xvii} This increase in broadband adoption is especially telling given that it occurred during an economic recession. Importantly, the average monthly bill for broadband service in April 2009 rose to \$39, an increase from \$34.50 in May 2008.

Figure 3:



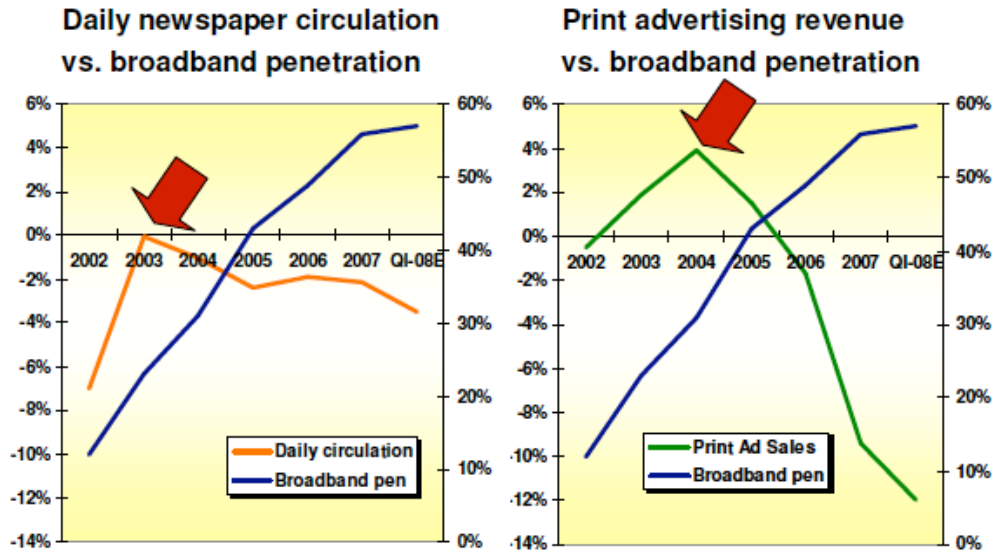
Mutter, Alan D. "How the Internet hurt U.S. newspapers. Could it happen in other countries, too? Executive Briefing International Newspaper Marketing Association. Los Angeles, CA. May 7, 2008.

BROADBAND AND NEWS

The realization of universal broadband has significant consequences for the news industry. Alan Mutter, a former journalist and current consultant to the news industry suggests, “The abrupt decline of the newspaper business in the United States is strongly correlated with the rapid adoption of inexpensive broadband Internet service.” In Mutter’s comparison of data on the rise of high-speed Internet services and the decline of the U.S. newspaper industry, he argues that “it is evident that circulation began deteriorating when household broadband penetration reached 23% in 2003 and that advertising began faltering when high-speed Internet adoption hit 31% in the following year.” Moreover, the accelerating deterioration of the U.S. newspaper business since 2004 coincides with the near doubling of broadband adoption in the same period. With broadband penetration at a record 57 percent at the end of the first quarter of this year, print advertising sales were down by unprecedented double-digit rates and daily circulation was off by a record 3.5 percent (See Figure 4). To help put these numbers in perspective, even though the U.S. population has more than doubled in the last 60 years, absolute newspaper circulation in 2008 was lower than it was in 1946. Newspaper penetration today amounts to less than 18% of the U.S. population, as compared with more than a third of the population in 1946.^{xiii}

Figure 4: Daily Newspaper Circulation and Broadband Adoption

Tipping point: 20% broadband adoption



Sources: Newspaper Association of America and Lechtman Research

Mutter, Alan D. "How the Internet hurt U.S. newspapers. Could it happen in other countries, too? Executive Briefing International Newspaper Marketing Association. Los Angeles, CA. May 7, 2008.

While some have argued that universal broadband services will save the news industry, it will require a significant rethinking of the current business model. As newspapers' circulation drops, news organizations are moving much of their operations online, yet the advertising revenue—the backbone of the newspaper's business model throughout the 20th century—has failed to move online as quickly as news readers have. Alberto Ibargüen, President of the John S. and James L. Knight Foundation, testified to the US Senate regarding the future of news and information in America arguing: "Nothing Congress can do is as important as providing universal digital access and adoption." Yet, when asked how to reconcile his testimony with the fact that increased high speed access to the Internet has hurt the newspaper industry, Ibargüen replied, arguing for nothing short of a whole-scale reconsideration of news and information industries: "the key issue is not how to save newspapers but how to inform communities so they may properly function. That 'proper functioning' means I define as communities identifying their own challenges and opportunities, bonding around common definition and determining their own, true interests."^{xiv} Thus, clearly the question of what impact that the introduction of fast and universal broadband will have on the news industry needs further consideration. While the Internet is essential to so many daily tasks in the modern world, its impact on existing business models for the collection and distribution of critical information needs to be further considered. What will journalism look like, and who will pay for it are questions that broadband conversations not only bring front and center, but also open a number

of possibilities for how news and information will be gathered, distributed and verified moving forward.

Mutter's data does point to an important consideration that has not yet been raised surrounding debates regarding whether the federal government should step in and help the ailing news industry. If it is the case that as broadband penetration increases newspaper subscriptions, and thus profits, decline, then isn't the case that the government's commitment to introducing universal broadband is in effect a negative subsidy (or tax) on the news industry as it is currently constituted? By building and improving a new means of information exchange, has the Federal government in effect devalued a previous medium—the newspaper—that was at the heart of the current news industry's business model? And, if so, does the government have a responsibility to help news organizations successfully transition into the 21st century, more able to use new technologies and the infrastructure it helped create?

CURRENT ISSUES

The FCC is moving quickly towards developing a national plan for fast and universal broadband that is to be delivered to Congress in February 2010. The \$7.2 billion guaranteed in the Federal stimulus bill in January 2009 is simply a down payment on what most realize will be a costly yet critical down payment in American infrastructure and productivity in the Information Age.

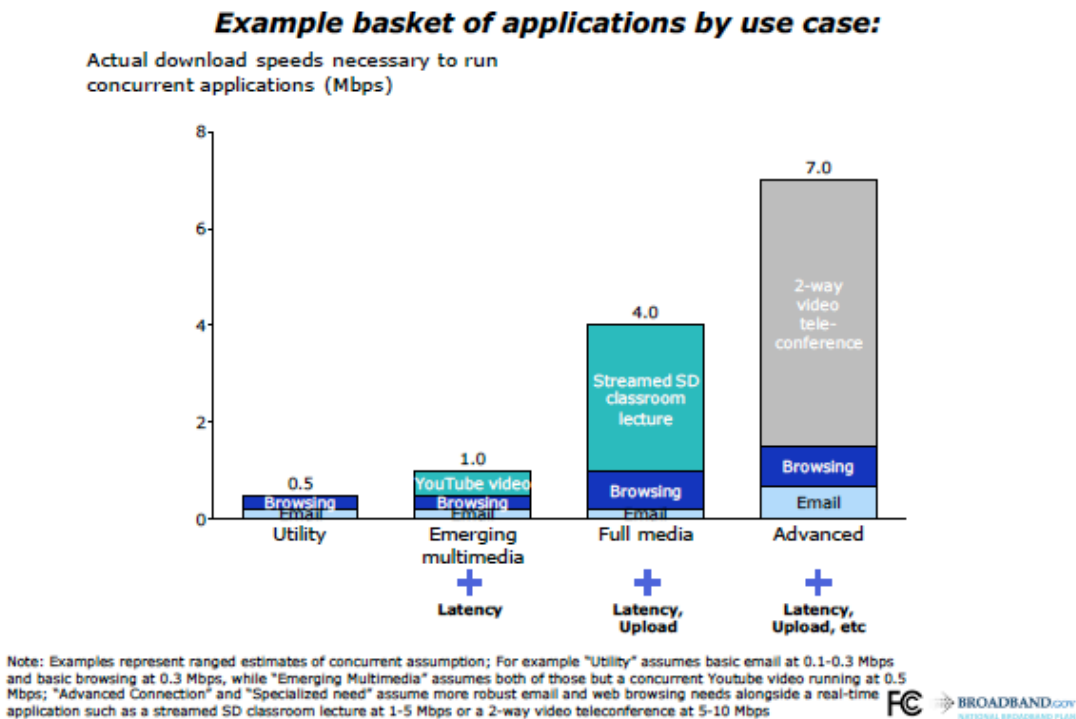
Recently, the FCC announced that it might cost up to \$350 billion to upgrade the American broadband infrastructure in a capacity to compete globally with Japan, South Korea and Northern Europe. Noting that American competitiveness rankings were slipping due to its poor Internet speeds and high costs when compared to its global competitors, the FCC argued that massive Federal support may be needed to avoid further decline in America's international economic standing. As an example, the US dropped from #2 to #7 in its technological infrastructure in 2008, largely due to a lack of access to affordable high-speed Internet networks. And, as a point of comparison, the Netherlands jumped five spots to #5 due to improved broadband capacity.^{xv}

Part of the problem, according to the FCC, is that while Internet providers advertise relatively fast broadband connections, in reality the data is transmitted at typically half the advertised speed due to increased demand on the provider's information servers and networks. Another critical issue in the American broadband market is competition: currently, 50 percent of Americans have access to only one broadband provider capable of offering Internet fast enough to support video conferencing. This lack of competition among Internet providers allows for high costs and discourages improved services. Of course, the \$350 billion figure is the high mark. According to the same report, the government can effectively make broadband universal, i.e. available throughout the country, albeit at slow speeds and high costs, for roughly \$20 billion.^{xvi}

Faster speeds are critical for two services in particular that have been identified as critical to long-term growth, innovation and productivity: long-distance education and business teleconferencing. Simply put, reliable and interactive video capacity is essential for both features that have been identified as critical activities for business and governments as they proceed into the 21st

century information environment. A lack of cheap and reliable video capacity will slow down decision-making among businesses, putting them at a disadvantage to their international competitors. Moreover, long-distance education has the potential to connect great teachers with in-need students, a capacity that also is essential to the strength of the American school system. For a further illustration of the types of speeds required for particular uses of the Internet, see Figure 5: Example Basket of Applications by Use Case.

Figure 5:



Finally, it in addition to questions of speed and access, it is also important to consider questions of ability. A recent report issued by the FCC indicates that 96 percent of Americans have access to broadband, which means that 33 percent of Americans have access to broadband services but choose not to subscribe. Socio-economic factors, as well as age are likely responsible for this group of non-adopters turning away from high-speed Internet. South Korea, one of the world's leaders in broadband penetration, had a similar problem getting older generations and the economically disenfranchised online, but was able to overcome fears and misconceptions of the new technologies through a targeted infrastructure and media literacy campaign. A survey conducted by the Pew Internet and American Life Project indicates that education is a critical factor in predicting

broadband adoption at home: only 52 percent of High School graduates were connected to the web via broadband, compared to 83 percent of college graduates. Moreover, 85 percent of adults in households that reported an annual income over \$75,000 subscribed to broadband.^{xvii} Thus, questions surrounding the importance of broadband are not simply about infrastructure, but also socio-economic factors, especially education and income. While the FCC continues to debate on how to best wire America for a future of ubiquitous broadband, there is work to do in schools and elsewhere in order to ensure that Americans understand the benefits and are capable of using high-speed internet.

Notes

ⁱ Rush, Benjamin. Address to the people of the United States (1787), *available at*

<http://teachingamericanhistory.org/library/index.asp?document=1779>

ⁱⁱ Copps, Michael J. *Bringing Broadband to Rural America*. Washington, D.C.: Federal Communications Commission, 2009. P. 15.

ⁱⁱⁱ Copps, Rural Broadband (2009: 16).

^{iv} Mitch Waldrop, *DARPA and the Internet Revolution*, in *DARPA: 50 YEARS OF BRIDGING THE GAP* 83 (2008), *available at*

http://www.darpa.mil/Docs/Internet_Development_200807180909255.pdf

^v Clark, Jessica, Kinsey Wilson, Rey Ramsey, Sascha Meinrath and Ellen Hume. “Defining Public Media for the Future.” *The American Prospect*. April 30, 2009.

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^{vi} Turner, Derek, Victor Pickard, Josh Stearns, Craig Aaron, Josh Silver, Lauren Strayer, and Candice Clement. *Changing Media: Public Interest Policies for the Digital Age*. Washington, D.C.: Freepress, 2009.

vii Copps, *Rural Broadband* (2009: 8).

viii International Telecommunication Union. *Measuring the Information Society: The Ict Development Index*. Geneva, Switzerland: International Telecommunication Union, 2009.

ix Copps, *Rural Broadband* (2009: 1-2).

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xii Horrigan, John B. "Home Broadband Adoption 2009." *Pew Internet & American Life Project*, June 17 2009.

xiii Mutter, Alan. "How the Net clobbered U.S. media." *Reflections of a Newsosaur*, May 7, 2008. Available online at: <http://newsosaur.blogspot.com/2008/05/how-net-clobbered-us-media.html>

^{xiv} Alberto Ibarra, Hearing on the Future of Journalism, Senate Committee on Commerce, Science and Transportation; Subcommittee on Communications, Technology and the Internet, May 06, 2009.
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^{xv} W. David Gardner, "National Broadband Could Cost \$350 Billion," *InformationWeek*, Sept 30, 2009,
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^{xvi} Federal Communications Commission, "September Commission Meeting," Sept. 29 2009.

^{xvii} Ibid.