International Journal of Communication 6 (2012), 2555–2575 1932–8036/20120005

Broadband Adoption
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Toward an Inclusive Measure of Broadband Adoption

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Accrual of the benefits of broadband connectivity differs from user group to user group. This dynamic impacts the structure of broadband adoption programs, the crafting of policy responses to the digital divide, and the measurement of outcomes. Thus a one-size-fits-all definition and measure of broadband adoption should be resisted, lest certain types or levels of usage unique to a particular group be dismissed or undercounted. This article proposes development of a more inclusive understanding of broadband adoption that measures the intensity of broadband use by harnessing quantitative, qualitative, and anecdotal data stemming from training programs, consumer surveys, and other such sources.

Keywords: broadband, adoption, utilization, training, measurement, intensity, United States, FCC, NTIA, senior citizens, low-income

Major communications policy initiatives in the United States over the last two decades have focused on assuring universal Internet access and promoting development of the skills needed to effectively utilize connections. These policies have generally supported a legal and regulatory environment that has encouraged enormous investment in the physical infrastructure of broadband networks (Crandall & Singer, 2010), resulting in near-universal availability in the United States (National Broadband Map, 2012; cf. Federal Communications Commission [FCC], 2012b, para. 1). Competition among service providers in the wireline and wireless spaces has driven down prices over the last decade and expanded the universe of service offerings available to consumers (FCC, 2010). Moreover, numerous efforts

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Date submitted: 2012–09–12

dedicated to improving the digital literacy skills of users have been launched over the last decade to promote more informed use of the Internet.

Unfortunately, near-universal access to broadband and the wide availability of training programs have not translated into ubiquitous adoption. Recent data indicate that less than 70 % of U.S. households subscribe to broadband (NTIA, 2011). The unconnected are disproportionately older and from low-income households. The adoption rate among African Americans and Hispanics is significantly lower than among Whites; people with disabilities lag even further behind. Equally troubling is a general lack of data regarding how adopters are using their connections and whether these uses deliver any tangible benefit. As broadband continues to transform vital sectors like health care and education, acquiring a perspective that favors universal adoption is crucial because the economic and social costs of remaining unconnected are rising inexorably (Horrigan, 2012).

To date, policies aimed at closing gaps in broadband connectivity have been informed by rather rudimentary data. Indeed, these data typically encompass only basic metrics like the total number of household connections in a given area, a general measure of how people use their connections (e.g., the websites they visit), and why some choose not to subscribe. However, a growing body of work has succeeded in identifying a number of barriers to broadband adoption, as well as the many benefits of informed use of this technology, across certain user groups. Taken together, these efforts provide a more comprehensive picture of broadband connectivity in the United States, one that is further enriched by anecdotal and qualitative data emerging from adoption-oriented programs in communities across the country. Regrettably, though, there has been little effort to acquire a more expansive view and measure of broadband adoption by merging these various data sets.

This article proposes to move beyond traditional measurement and analytical techniques by developing a more inclusive understanding and measure of broadband adoption. Ideally, such a metric would be able to quantify the intensity of use—not only whether and how often people use their broadband connections, but also the value they derive from it. Deploying such a measure of "broadband intensity" is essential to crafting effective policy responses and informing efforts to modernize policies impacting the broadband ecosystem.

The Evolution of Broadband Adoption Assessment in the United States

The federal government, via the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA), began to collect and analyze data on household adoption of new communications technologies in 1994 (NTIA, 1995). The primary goal of these early efforts was to identify and profile households that had yet to acquire a computer or a modem. NTIA reports released between 1995 and 2000 identified a "digital divide" in the United States, a term adopted to describe a growing gap between those groups that were readily adopting new technologies and those that were not (NTIA, 1998, 1999, 2000).

The primary policy response to these data was captured in the Telecommunications Act of 1996, a monumental piece of legislation that sought to comprehensively update U.S. communications policy for

the first time since 1934. Echoing the findings of early reports, the act created E-Rate, a subsidy program to support "the traditional providers of information access for the general public—the public schools and libraries" (NTIA, 1995). Carved out of the new federal Universal Service Fund, E-Rate provided eligible schools and libraries with "discounts on the purchase of all commercially available telecommunications services, Internet access, and internal connections" (FCC, 1997). Other federal agencies developed additional grant programs.

The animating force of these early efforts was a desire to expand the traditional notion of "universal service" in the telecommunications space[1] to ensure that "anyone who wants to form a business to deliver information will have the means of reaching customers. And any person who wants information will be able to choose among competing information providers, at reasonable prices" (Gore, 1993). In other words, assuring ubiquitous access to these emerging services was of paramount importance. By the turn of the century, however, additional data and analysis made clear that the issue of access was much broader and more complex than just determining whether an Internet connection was available in a given area.

A Fundamental Shift in Broadband Adoption Analysis

Over the course of the last decade, it has become clear that many factors influence whether or not a particular person chooses to purchase Internet access and use it regularly at home. The early focus on the digital divide only drew attention to the fact of the disparity in penetration rates. More in-depth analyses undertaken by NTIA and others around the turn of the century revealed the full array of characteristics associated with adopting advanced communications services. Foremost among these was the need to possess the skills to effectively harness Internet connections and put them to life-enhancing uses (Mossberger, Tolbert, & Stansbury, 2003, p. 4).

The rapid emergence of broadband networks intensified the desire to reformulate traditional notions of the digital divide and study the factors influencing adoption decisions. These networks provided consumers and businesses with faster, more reliable connections to the Internet and, eventually, a more affordable alternative to dial-up service. These connections also encouraged firms at the edge of the network to develop more advanced interactive services that exploited the additional bandwidth. Organic market forces, coupled with a minimalist regulatory approach, drove broadband deployment to nearly every household in the country (Spulber & Yoo, 2008). This regulatory framework also fostered intense intermodal competition among service providers, driving prices down and spurring further investment in next-generation infrastructure (Shelanski, 2007).

NTIA reports from this period reflected both the exponential growth of the broadband subscriber base and the increasingly pervasive nature of Internet connectivity at home, in the workplace, at school,

[1] "Universal service" is a term of art in the telecommunications space. Federal law tasks the FCC with adopting and implementing policies aimed at "making vital communications services accessible to all Americans" (FCC, 2012a).

and elsewhere.[2] Moreover, these reports underscored broadband's importance to economic development, job creation, and overall quality of life (NTIA, 2008). As a result, policymaking in this space broadened to encompass "clear[ing] away regulatory obstacles that could thwart the investment that fuels development—and deployment—of new technologies" (NTIA, 2008, p. i). This included clarifying the regulatory treatment of broadband Internet access services and freeing up additional spectrum resources to support the build-out of mobile data networks capable of delivering broadband-level speeds to more sophisticated handsets.

In this environment, broadband became a platform for building new industries (e.g., social media) and a vital conduit delivering a growing universe of new services to end users. Broadband also established itself as a disruptive force in a number of sectors (e.g., health care), generating enormous welfare gains for consumers across every demographic group (Davidson & Santorelli, 2009b). A growing consensus acknowledging the transformative power of broadband led to more multifaceted inquiries into the digital divide.

The need for a more nuanced understanding of the factors influencing adoption decisions was heightened by federal legislation in 2009, which called on the FCC to prepare a plan for realizing several national purposes for broadband (American Recovery and Reinvestment Act, 2009). While preparing its response to this Congressional mandate, the FCC focused largely on trying to understand the dynamics of broadband adoption (Dailey, Bryne, Powell, Karaganis, & Chung, 2010; Davidson & Santorelli, 2009a; FCC, 2009; Gant, Turner-Lee, Yi, & Miller, 2010). In its *National Broadband Plan*, the FCC (2010) noted:

> broadband adoption and utilization are not about owning a specific piece of technology or subscribing to a service but about making the Internet work for people. Getting people online is a critical first step, but the goal must be to keep people online through sustainable efforts that promote utilization and help each user derive value from the Internet in his or her own way. (p. 170)

Perhaps more critically, the FCC distinguished for the first time between adoption and utilization: "'Adoption' refers to whether a person uses a broadband service at home or not; 'utilization' refers to the intensity and quality of use of that connection to communicate with others, conduct business and pursue online activities" (2010, p. 169).

The Need for an Inclusive Measure of Broadband Adoption

Taken together, these analyses made clear that each user group faces a unique set of legal, regulatory, and perceptional barriers to more robust adoption and utilization. NTIA, through its Broadband Technology Opportunity Program, has sought to address some of these barriers by funding programs focused on raising awareness, promoting "sustainable broadband adoption," and bolstering digital literacy

[2] Even though the FCC has adopted a speed benchmark of 4 mbps downstream and 1 mbps upstream when assessing broadband in some contexts (FCC, 2012b, para. 7), it still considers a connection to be "broadband" if it exceeds 200 kbps in either direction (FCC, 2012c).

skills across discrete user groups (Federal Register, 2009). But despite the appearance of considerable momentum toward creating more opportunities to connect new users to broadband, it is difficult to measure these programs' effectiveness at spurring meaningful uses of this technology. Indeed, in the absence of data regarding how new adopters are using broadband and whether those uses generate any sort of value, it is impossible to know whether the country is on a path toward realizing the national purposes identified by Congress and the transformative potential most agree this technology possesses.

In sum, notwithstanding a clear public policy imperative to increase informed and meaningful uses of broadband across every user group, there has been little effort to improve upon how adoption is defined and measured. The vast majority of analyses focus almost wholly on inputs to adoption, to the exclusion of outcomes like the practical impact of broadband on a particular group (FCC, 2012b, para. 94–96). A more inclusive view of adoption would allow policy makers, researchers, service providers, and others to gain deeper understanding of how individuals and communities are harnessing broadband. It would also allow for more narrowly tailored policy responses, which could be carefully calibrated to address specific needs of a particular user group or geographic area.

Informing a More Inclusive Measure: Lessons from Major Broadband Adoption Initiatives

A more inclusive measure of broadband adoption should be informed by "real-world" data and feedback from actual users and nonusers. Aggregating and analyzing this type of qualitative data, and supplementing it with existing subscription and survey data, will reduce the subjectivity inherent in identifying what constitutes a meaningful use of broadband.

To begin the process of developing such a measure, this section profiles two programs that work to connect nonadopters and promote informed use of new connections among senior citizens and low-income households. Both offer important insights into techniques that result in sustainable broadband adoption and highlight the type of data that will be useful in identifying the contours of meaningful use within these groups.

Case Study 1: Older Adults Technology Services

Older Adults Technology Services (OATS), a nonprofit organization based in New York City, provides training services and community programs to help senior citizens effectively use computers and the Internet. Founded in 2004, OATS's mission is to "harness the power of technology to change the way we age" (OATS, 2011a). Over the last eight years, OATS has grown into a program with a citywide footprint offering a wide array of training courses for seniors of all skill and interest levels. The organization has provided over 11,000 free classes for seniors, built more than 20 computer labs for community partners, and will be launching the country's first technology-themed community center for seniors in late 2012 (Broadband USA, 2010).

Program overview. The OATS model was developed to address New York City's pressing need for senior-focused Internet training programs (Davidson & Santorelli, 2008, p. 11). Research conducted prior to the program's launch suggested "many training programs [in the city] were not customized for

older learners" (Davidson, Santorelli, & Kamber, 2010, p. 51). In particular, many of these programs relied on curricular materials and teaching methods that "presented[ed] information too quickly and with no sensitivity to the learning priorities of older individuals" (ibid.).

This initial needs assessment yielded results that mirrored a national problem regarding Internet connectivity among seniors (ibid.). Older adults have adopted computers and broadband at a much slower pace than most other demographic groups over the last decade. NTIA (2011, p. 14) found that by the end of 2010, only 45% of adults over the age of 65 had adopted broadband at home, compared to 77% of adults between the ages of 18 and 44. In addition, data indicated that 45% of seniors lacked a home computer, compared to less than 20% of adults between the ages of 18 and 64 (ibid.). This divide is largely due to a range of barriers impeding more robust adoption by seniors. These include concerns about usability and security, and a general lack of digital literacy skills (Davidson & Santorelli, 2009a, pp. 11–17). Unconnected seniors also tend to be acutely price sensitive because many live on fixed incomes (Davidson & Santorelli, 2008, p. 10).

In light of these trends, OATS has developed an outreach and training program specifically for older adults (ibid.). Through its operations and courses, OATS attempts to frame Internet access as a more convenient way of accessing and receiving state and federal government benefits, as well as an essential resource for health, social engagement, and financial security. As a group, seniors are poised to benefit most immediately from these types of services (see, e.g., Gardner, 2010, pp. 8–12). And despite the barriers to more robust connectivity, there is significant evidence that seniors view advanced communications technologies like computers, cell phones, and the Internet as vital conduits for staying in touch with family and otherwise remaining "relevant" (see, e.g., Orlov, 2011, p. 9). Accordingly, OATS works in this community to present what it believes to be a compelling value proposition for adoption.

Scope of activities. OATS's programmatic universe has expanded significantly over the last eight years, evolving from basic training classes (e.g., how to turn on a computer and maneuver a mouse) to a menu of intermediate and advanced classes covering a range of online activities (e.g., workforce development and use of social media) (OATS, 2011b). OATS trainers work with small classes of 10–12 seniors convened in computer labs and senior centers across the city.

The structure of these classes aims to create a feeling of community and social connectedness among trainers and students (Gardner, 2010, p. 7). For example, OATS designed an intergenerational program meant to enhance senior-focused training while also improving participants' connections with their immediate communities (OATS, 2011c). As previously mentioned, OATS also works to link seniors with online government resources in order to promote social and civic participation, two activities that have proven to enhance overall well-being among older adults (Gardner, 2010, p. 14). In addition, OATS has launched a Web-based community—Senior Planet (www.seniorplanet.org)—specifically designed for seniors. These efforts have received significant funding from the Broadband Technology Opportunity Program, which will, among other things, support the creation of a senior-focused community center with the capacity to serve 10,000 visitors per year with training, technology exhibits, events, technical support, and capacity building for New York City's network of 250 senior centers (Broadband USA, 2010).

Results to date. By partnering with more than 70 organizations throughout the city and assembling diverse sources of funding from government, philanthropy, and contracts with other nonprofit partners, OATS has developed the nation's largest municipal program providing seniors with technology services. Since its founding, the organization has taught over 7,800 individuals, developed 29 new computer labs, and distributed more than 500 computers to seniors.

Most OATS courses last 10 weeks and meet twice per week. At the end of the course, participants are asked to fill out online evaluations (OATS, 2012). The vast majority have reported feeling more connected to family and community, and an even larger share have said they were using their connections to access health information (ibid.). Additional interviews with participants and local partners have reinforced that OATS classes are popular with participants and often have the effect of bringing new members into senior centers (Gardner, 2010).

A 2010 study of the social impact of OATS programs tracked the progress of 75 participants at four program sites from enrollment through training and for 6 months after graduation (ibid.). All participants had computers and Internet at home. This study found extensive evidence that participants learned and retained computer and digital literacy skills, with over 93% still using computers regularly after 6 months (ibid.). Moreover, the social benefits of training were substantial:

- 64% reported more contact with friends and family;
- 71% were accessing health information online; and
- 44% said they had more awareness of social and civic activities, and 24% indicated that they actually participated more in such events as a result of the course (ibid., pp. 5–6).

Further analysis of this data concluded that the OATS classes generally provided students with a range of new "opportunities to establish community ties" (Gardner, Kamber, & Netherland, 2012). This positively impacts seniors, as "feeling part of a community . . . promotes good mental health and overall well-being, and is essential to active aging" (ibid.).

Key insights. The preceding analysis of the OATS model yields several important insights relevant to developing a more inclusive measure of broadband adoption.

The ways in which effective programs are structured and evolve over time are useful markers for identifying the contours of "meaningful use" within a given community. As the OATS case study demonstrates, seniors bring a particular set of expectations to technology education. Outreach and training programs keyed to these needs hold great promise for encouraging broadband adoption and putting that adoption to meaningful use. Seniors seem to appreciate and even prefer programs that acknowledge and account for this distinct perspective. In addition, the evolution of the roster of classes offered by OATS indicates this community's significant latent demand for training in a range of activities.

Any metric designed to gauge the intensity of use by this or any other demographic group should reflect such a broad range of activities and attempt to quantify the extent to which those uses enhance lives. To that end, the anecdotal and qualitative data generated by programs like OATS are essential to filling in the contours of meaningful use. The "social return on investment"[3] for these kinds of programs can be extraordinary: graduates interviewed in a number of OATS-related surveys reported life-changing benefits and lasting results (Gardner, 2010; Gardner, Kamber, & Netherland, 2012). However, the value of this type of data, especially in the context of expanding the conventional view of broadband adoption, could be greatly enhanced by linking it with longitudinal data on the general economic, social, and health impacts of these new adopters' regular broadband use.

Ultimately, surveys that simply inquire whether seniors have used the Internet or whether they have broadband at home often miss important information about the kind of adoption and utilization that is taking place. Older adult adopters can run the gamut from individuals with very limited skills to those who are expert daily users. While the OATS model suggests that intensive training can bring virtually all participants online, it is important to distinguish between the usage patterns of more advanced participants and those who may have figuratively "dipped a toe in the water."

In sum, as new methods are developed to capture, quantify, and assess seniors' broadband adoption and utilization, it is essential that these approaches reflect the categories of activity underlying technology use. These measures should account for the value derived from basic uses such as e-mail, video chat, reading news, and surfing the Web, as well as more advanced uses of telemedicine, e-health services, workforce development programs, and tools that promote economic security and civic participation. Harnessing the relationships, experiences, and data stemming from the efforts of groups like OATS is critical to developing a more robust understanding of the adoption dynamics within the senior community, including how seniors develop and retain digital literacy skills, what motivates them to put their connections to various uses, and which of those uses have meaningful impacts on their lives.

Case Study 2: Internet Essentials

Internet Essentials is a broadband adoption and training program for qualifying low-income households that is supported and administered by Comcast, the nation's largest broadband service provider (Comcast, 2012b). Launched in May 2011 in Chicago (Ramsay, 2011), it has since expanded throughout the company's entire service territory (Comcast, 2012c).

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[3] Emerson, Wachowicz, & Chun (1999) first described the "social return on investment" (SROI) concept and metric in an attempt to evaluate the social outcomes of organizations that received grant funding from a major philanthropic foundation. More specifically:

> A central part of the SROI analysis is built upon the notion that the economic value of social programs comes in the form of costs presently being carried by one industry (say, for example, community corrections or emergency health services), being decreased by another (for example, jail diversion or primary health care programs). (p. 161)

Program overview. Comcast first conceived of launching a program that would eventually become Internet Essentials in a letter submitted to the FCC during review of the company's proposed merger with NBC Universal (Zachem, 2010). The company committed to designing and deploying a program that would "substantially increase broadband adoption in low-income homes throughout Comcast's service area" (ibid., p. 4). As the letter noted, the broadband adoption rate among households with annual incomes of less than $20,000 within its service territory was 40% (ibid.).

When it approved the merger of the two companies, the FCC (2011b, para. 6 & Appendix A, section XVI.2) made this commitment by Comcast enforceable. The resulting program was developed to overcome three core barriers to broadband adoption within this community: (1) the cost of broadband access; (2) lack of a computing device in the home; and (3) low levels—or complete absence—of digital literacy. The target population of Internet Essentials was low-income households with school-age children located in the company's service territory. Eligibility initially hinged on the following criteria: "at least one child in the household [is] eligible for a free lunch under the National School Lunch Program (NSLP); the household is not the subject of a current Comcast collections activity; and the household has not subscribed to a Comcast Internet service within 90 days prior to installation" (ibid.). Comcast committed to working with state education departments and local school districts to certify household eligibility.

After several months, Comcast adjusted the eligibility criteria to make the program available to a wider swath of households. In particular, it "extend[ed] eligibility to families with children qualified to receive reduced price school lunches as well" with the hope of making the program available to an additional 300,000 families (Comcast, 2012a, p. 4). By July 2012, more than 2.3 million families in its territory were eligible for Internet Essentials (Comcast, 2012g, p. 3).

Numerous studies and surveys assessing broadband adoption and utilization have clearly indicated the need for a program focused on connecting low-income households. Indeed, low-income households have been identified as digital laggards since the very first NTIA reports, released in the mid-1990s (NTIA, 1995, 1999). The broadband adoption rate for this group has increased steadily over the last decade, but it remains substantially lower than the national rate (NTIA 2011, p. 12). Connectivity brings primarily economic benefits to this group, allowing access to a wider array of job and educational resources and resulting in cost savings through participation in e-commerce and cost-effective services like telemedicine (see, e.g., Digital Impact Group & Econsult Corporation, 2010).

These benefits—and the imperative to connect low-income households—are much more forceful when school-age children are present (eSchool News, 2012). The impacts of broadband on K–12 education are well documented, as is the essential nature of acquiring the digital literacy skills needed to compete in the 21st-century workforce (FCC, 2010, Chapter 11). However, these impacts are greatly augmented when classroom exposure is coupled with in-home computer and broadband utilization. Indeed, as the FCC (2011a, p. 4) has noted, "home computer access and use are positively associated with increased academic achievement and test scores."

Scope of activities. Initially, Internet Essentials participants were offered an "economy"-level broadband package, which promised download speeds of 1.5 megabits per second (mbps) and upload

speeds of 384 kilobits per second (kbps) (Murphy, 2011). Comcast (2012a, p. 4) eventually increased these speeds to 3 mbps for downloads and 768 kbps for uploads. The cost of this service is fixed at $9.95 per month (exclusive of tax) (Comcast, 2012b). Enrollees will not see their monthly subscription price rise during the term of their participation in the program and will continue to receive discounted service as long as they meet the eligibility criteria (Comcast, 2012c).

Reflecting numerous studies indicating that a majority of low-income households lack a computing device capable of harnessing their new home broadband connection (e.g., NTIA, 2011, p. 4), Internet Essentials also offers participants the opportunity to purchase a "netbook-style" laptop computer for $149.99 (exclusive of tax) (Comcast, 2012c). These devices support both wired and wireless (via WiFi) connectivity (ibid.). Much like the discounted monthly subscription price, the offer of low-cost laptops to enrollees recognizes that for many nonadopters, the up-front or "fixed" cost of having to purchase a computing device is a barrier to broadband adoption (NTIA, 2011, p. 37).

To demonstrate to enrollees that their broadband connection can and should be used in ways that can positively impact adults and children in the household, Comcast has made available a wide range of training and educational materials. These include resources that fall into three broad categories: (1) assuring safe Web use for parents and children, including information on social networking and cyber bullying (Comcast, 2012f); (2) providing information to safeguard computers from viruses and other nefarious cyber attacks (e.g., identity theft and phishing) (Comcast, 2012e); and (3) digital literacy development via free in-person training, as well as online and printed materials (Comcast, 2012d).

The reason for offering these resources is twofold. First, basic digital literacy skills are increasingly necessary to complete homework assignments and apply for and perform a growing number of jobs (Anderson, 2011). Thus, Internet Essentials seeks to make broadband connections useful to new subscribers (Comcast, 2012a, p. 13). Second and related, the larger goal of Internet Essentials is to help new adopters "understand the value, the relevance and the ease of use of the Internet" (ibid.). This is essential because NTIA (2011, p. 36) reports that 52 % of households without a computer—many of which are likely low-income—cite "don't need it/not interested" as the primary reason for being unconnected to broadband. The need to offer a clear and tangible value proposition to nonadopters is widely regarded as vital to convincing skeptics that the benefits of broadband connectivity outweigh the costs (e.g., FCC, 2010, p. 171; cf. Dailey et al., 2010, pp. 15–16).

Results to date. In July 2012, Comcast submitted its first Internet Essentials status report to the FCC.[4] It noted that:

[4] In its order approving the Comcast–NBCU merger, the FCC (2011b, Appendix A, section XVI.2.m) required the newly merged entity to submit an annual report describing its efforts in support of the broadband adoption condition. Since these conditions are legally binding and enforceable by the FCC, there is a presumption of accuracy of the self-reported data for the Internet Essentials program.

- Internet Essentials connected 91,000 low-income households to broadband in its first full year, "bringing approximately 182,000 children and 364,000 low-income Americans" online (Comcast, 2012g, p. 18).

- 11,548 participants purchased laptop computers through the program (ibid.).

- Internet Essentials also convened "400 in-person digital literacy sessions during the 2011–2012 school year with more than 3,000 attendees" (ibid., p. 17).

- According to surveys conducted by Comcast and third parties, 86% of participants are highly satisfied with the program (ibid., p. 19).

Key insights. The foregoing overview of the Internet Essentials program, along with the data that Comcast has made available, yields useful insights for developing a more inclusive measure of broadband adoption.

First, the data suggest that some of the insights stemming from national surveys attempting to measure adoption of and attitudes to broadband might be flawed or insufficiently rigorous. An illustrative example is the rather tepid initial response to the program's offer of low-cost laptops. As Comcast (2012a, p. 37) observed, existing data and analyses "suggested that lack of computer hardware in the home was a major hurdle to closing the broadband adoption gap" within this community. However, during the initial phase of the program, the vast majority of enrollees already owned a computer, and of those that did not, "only a third thought price [of a computing device] was a barrier" (ibid.). While these data on their own are not dispositive of a new adoption trend within this population,[5] the disparity in findings underscores the many downsides associated with relying on national analyses and sweeping generalizations when designing community-specific adoption and outreach programs.

Second, these types of discrepancies with existing data, although possibly an anomaly, could undermine the widely held belief that most low-income households lack basic digital literacy skills. If so, data collection and analysis would have to be adjusted accordingly to acquire a more accurate view of how low-income households use and benefit from digital technologies. Comcast does note that its experience with this user group has led it to conclude that "there is a wide range of digital literacy readiness," requiring it to make several adjustments to its training offerings (ibid., p. 43).

Third, national survey data are incapable of providing a nuanced view of how different user groups utilize broadband. The initial phase of Internet Essentials has made clear that the low-income

[5] Initial enrollees in Internet Essentials could represent the more technologically savvy of this population. This echoes Moore (2002), who built on Rogers' (2003) seminal work to identify five different types of potential adopters: (1) innovators; (2) early adopters; (3) early majority; (4) late majority; and (5) laggards. It is reasonable to assume that initial enrollees in Internet Essentials are part of the first two or three groups described by Moore.

demographic, like many other under-adopting user groups, is hardly monolithic when it comes to how individual members of this community perceive broadband and decide whether and how to use it. For example, the data point to a correlation between "the schools that aggressively promote the program and the number of families signing up" for the program (ibid.). This suggests that the argument that broadband could help to improve educational outcomes resonates deeply with members of this user group, an observation further bolstered by survey data showing that 90% of enrollees use their Internet connection to complete homework assignments (Comcast, 2012g, p. 19). However, the survey also indicated that only half of participants used their connection to search for a job (ibid.), a finding that suggests that despite best efforts, the economic value proposition may not be resonating with this population.

In sum, these data and observations provide stakeholders with more nuanced insights into how members of the low-income community perceive broadband and make adoption decisions. This type of qualitative and anecdotal data is essential to formulating more compelling value propositions and developing effective programmatic responses to address the needs of community members.

Toward a More Inclusive Measure of Broadband Adoption: The Broadband Intensity Metric

The experiences of OATS and Internet Essentials support the view that the mechanics of bolstering broadband adoption, digital literacy, and meaningful use are exceedingly complex. Indeed, basic assumptions and correlations drawn from national surveys like those released by NTIA and Pew appear to differ in important ways from the realities encountered by those working to overcome barriers and bring people online for the first time. Reducing these apparent discrepancies will require a more inclusive measure and understanding of broadband adoption and utilization, one that can harness the diverse array of data points stemming from outreach and training programs like OATS and Internet Essentials and bring it to bear.

Such a measure would be of value to policymakers as they consider policy responses to the digital divide (e.g., additional grant or subsidy programs); to stakeholders "on the ground" as they seek to hone their outreach and training programs; to experts and researchers as they further deepen their inquiries and measurement methods; to current adopters who wish to utilize their broadband connections in more meaningful and welfare-enhancing ways; and to nonadopters, who stand to benefit most immediately from efforts to improve broadband connectivity across every user group in the United States.

In furtherance of these goals, this section conceptualizes a new metric to measure "broadband intensity" (BBI) in an effort to deepen the collective understanding of the dynamics and contours of broadband adoption within and across discrete user groups.

The Rationale for a More Inclusive Measure of Broadband Adoption

The quantitative, qualitative, and anecdotal data generated by programs like OATS and Internet Essentials, along with dozens of similar initiatives that have been launched in recent years, offer unique

insights into how people decide whether to adopt broadband and how they actually use their connection and derive value from it. Achieving a deeper understanding of these dynamics at the local, state, and national levels is vital at a time when broadband is transforming nearly every aspect of modern life.

These new data points should be aggregated and systematically analyzed in an effort to gauge BBI. Implementing this analysis would have at least three broad impacts. First, devising such a measure is essential to assuring that policy and programmatic responses to adoption and utilization issues are sufficiently informed and properly calibrated. For example, efforts to modernize federal and state universal service funds could greatly benefit from a deeper understanding of the contours of adoption.

Second, the new measure would more accurately reflect the intragroup variations in broadband adoption and utilization, allowing for more precise targeting of subsidies and policy responses. As the OATS and Internet Essentials case studies demonstrate, the nature of broadband adoption—and the design of successful attempts to promote meaningful uses—is largely community-specific and tends to vary from city to city, and even from neighborhood to neighborhood. The reasons for these differences are myriad and tend to involve a complicated array of social, economic, and political forces that often muddle outreach and training efforts.[6]

Third, designing and implementing a more inclusive measure of broadband adoption would support a wider effort to build sound public policy on stronger empirical foundations. A critical aspect of this data-driven policy making is leveraging a more granular understanding of consumer behaviors to design systems and programs that aim to encourage or deter certain choices by individuals (Sunstein, 2011).

Conceptualizing a BBI Metric

There have been only a few attempts to develop such a metric in the context of broadband adoption. One leading proposal is the Broadband Adoption Index (BAI), which seeks to compare "a country's actual adoption against that country's ideal, welfare-maximizing broadband adoption rate" (Beard, Ford, Spiwack, & Stern, 2010, p. 349). Policy makers could use this metric when "set[ting] and establish[ing] particular targets for broadband adoption of various connection modalities based on the different value that each mode presents" (ibid., p. 350). What makes this proposed metric unique for the purposes of assessing broadband adoption trends is its inclusion of the "social value" of broadband in its calculations. According to the methodology for the BAI, the social value of broadband would be calculated "based on the benefits from consumption less the costs of production" (ibid., p. 352).

[6] Numerous examples illustrate how the interplay of these forces can hinder the deployment of broadband adoption initiatives. For example, Internet Essentials has thrived in cities like Chicago, a site of significant enthusiasm and "buy in" by school administrators. However, some have argued that the muted initial response to the program in Philadelphia was due to an array of political factors (Technically Philly, 2012).

Though the BAI is an important conceptual advancement, especially as one of only a few measures to encompass "every form of network access technology" (i.e., wireline and wireless) (ibid., p. 359), its practical usefulness for the purposes of measuring and spurring meaningful broadband use among under-adopting groups in the United States is limited. Indeed, the BAI was conceived as an attempt to more accurately compare broadband deployment and adoption among countries; any application within "political subdivisions" of those countries appears secondary (ibid., p. 351). The mathematical model underlying the BAI has been structured almost exclusively for the purposes of this type of comparison.

In addition, the social value formula used for the BAI relies on approximations of average user benefits—measured as "willingness to pay" for a connection—and of the "social premia" or spillovers accruing to the average user (ibid., pp. 352–353). These generalizations are meant to produce a figure that approximates the "actual value that a society is currently deriving from broadband" (ibid., p. 355). In short, the BAI does not seek to draw upon the large and growing universe of quantitative, qualitative, and anecdotal data generated by the many broadband adoption and training programs deployed across the U.S. in recent years. Failure to include these data points yields only a generic and inexact measure of the average social value realized via current broadband connections.

Despite its shortcomings, the BAI proposal does successfully demonstrate that "quantity-based measures of adoption, like those used widely today, fail to capture the heterogeneous social values between connections" (ibid., p. 374). In addition, Hauge and Prieger (2010) observe a general lack of rigorous analytical techniques to measure the effectiveness of demand-side programs focused on increasing broadband connectivity and meaningful uses of the technology. For the purposes of informing broadband adoption efforts in communities across the United States, stakeholders will benefit from a metric that looks beyond mere adoption and can capture the actual experiences of new and existing users.

Developing and deploying a framework for measuring BBI would satisfy this need for additional insights into how subscribers use their connections and whether a particular training or outreach effort effectively bolsters meaningful uses of this technology. Much like other complex measures that are often used to inform policy making (e.g., the Consumer Confidence Index), the BBI metric would represent a composite value that combines two distinct sets of data: (1) quantitative broadband adoption data (e.g., the total number of connections, reasons for nonadoption, uses of broadband, etc.), which are regularly collected in surveys conducted by groups like NTIA and Pew, and (2) experiential (i.e., qualitative and anecdotal) data collected by groups like OATS, Internet Essentials, and other organizations working within communities to bolster broadband connectivity.

Although this metric's primary purpose would be to more precisely identify and assess adoption and utilization trends within discrete user groups, BBI would be composed of a standard analytical framework to assure consistency. Ranges of ideal BBIs for specific user groups would be predetermined by policymakers, experts, and stakeholders working to connect the unconnected. This would entail a number of normative value judgments, which risk being dismissed as overly subjective if they are not grounded in the full range of data described above. For example, the BBI framework for seniors might give more weight to uses of broadband-enabled telemedicine applications because enhancing these types of activities

within this community is a policy objective (FCC, 2010). But determining what constitutes a meaningful use of telemedicine by a person with a particular profile (e.g., a homebound person under the age of 70 versus an active senior over the age of 75) for the purposes of BBI assessment could result in under- or over-inclusion of certain uses. Indeed, placing a premium on "high-value" uses of services like telemedicine could marginalize the importance of less intensive but equally important uses of broadband by a particular group (e.g., seniors using their connection to learn about community events via an online calendar). In such a case, the experiential data collected by organizations like OATS will be crucial to ensuring that an ideal BBI accurately reflects older adults' "real-world" uses and experiences.

As for the design of the BBI, the various measurement techniques developed by charitable organizations to evaluate nonfinancial returns on investment offer a valuable way of conceptualizing how the metric might be deployed. Emerson (2003), building on previous work, has proposed a "blended value" solution to the problem of quantifying social impacts of organizations delivering services in a diverse array of communities.[7] The movement to design alternative measures like blended value is evidence of a pressing need to understand, at a much deeper level, how organizations tasked with delivering social services create value for society. Critical to the endeavor to design the BBI metric is the recognition that "there is a wide array of value creation taking place . . . including those elements that are easily quantifiable and those that really do not lend themselves to existing approaches of measurement" (ibid., p. 41). This basic point has echoed across numerous other sectors and been adapted in the broadband context by researchers like Hauge and Prieger (2010), who have highlighted the need for further study of the outcomes and impacts of demand-side adoption and training programs.

The BBI metric would be well positioned to satisfy these needs and provide stakeholders throughout the broadband space and policy makers with a more expansive view of the mechanics and impacts of meaningful uses of this technology. However, designing the actual model and identifying specific data points to leverage are projects best undertaken by experts and stakeholders working in this space. Debates about inputs, variables, and other aspects of the BBI will be extremely fruitful and will likely generate a more rigorous methodology, assuming that these processes are sufficiently open, transparent, and participatory.[8]

Ultimately, boiling adoption and utilization data down to a single numeric value—or set of values—would provide both users and nonusers with a more tangible grasp of the value of a broadband connection. Similar types of numeric labels (e.g., credit scores) reflect a range of actions but provide

[7] Emerson, Bonini and Brehm (2004) mapped these multifarious methods in a broad range of sectors in an effort to identify barriers to and highlight best practices for enhancing the collective understanding of nontraditional attempts to measure social outcomes.

[8] One possible forum for these discussions is the National Institute for Standards and Technology (NIST), which is housed within the U.S. Department of Commerce. The FCC (2010, pp. 44–45, 226), in its *National Broadband Plan*, suggested NIST as a forum for the development of several new measurement standards, including one for measuring broadband deployment and for "locating, sharing and licensing digital educational content."

consumers with a benchmark against which they can adjust their behavior. For adopters and nonadopters alike, a measure like the BBI would facilitate development of a more tangible and forceful value proposition for adopting broadband and learning how to use it in welfare-enhancing ways.

Conclusion

Implementing a more inclusive measure of broadband adoption could drive a major paradigm shift in how the United States perceives and responds to the digital divide. Whereas previous approaches to closing this divide were built around improving superficial measures like penetration rates, the current environment requires a more robust framework for connecting the millions of unconnected households and assuring that all adopters are able to use their connections in meaningful ways. Adopting a broader perspective will require a similarly comprehensive tool like the BBI metric, which will provide stakeholders and policy makers with the information they need to develop appropriate responses.

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