The bumpy path of technological transformation: digital inclusion

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Introduction

As social media, massively multiplayer online games, and a networked way of life become increasingly common components of daily life, it may be worthwhile to look back at how the research community initially framed ideas about the challenges of the Internet and convergence in order to diagnose not just our processes of investigation, but the manner in which we conceptualize new technologies. Moral panics and moral imperatives attach themselves easily to material artifacts and new technological systems. While these might seem like extreme ways of characterizing the response to the Internet, in fact they are entirely in keeping with how prior technologies have been incorporated into social life, and how the research community and governments have addressed technological transformations.

Several communications technologies created moral crises in how they cultivated new tastes and new social patterns, and in so doing seemed to threaten existing power structures and relationships. Conversely, those same systems sometimes rose to the technological sublime, the term popularized by David Nye in his studies of large scale technological innovations such as electricity (Nye, 1992). Technological sublimes convey moral imperatives as they evoke a quasi-religious, emotional attachment. Major technological achievements in the U.S. such as the Erie Canal or the transcontinental railroad in the U.S. or the national electrical grid embody imagined transformative capabilities, the myth and the hope transcending the actual problems and difficulties that often accompany the diffusion or creation of such systems; doubtless similar examples exist in Korea. Marvin (1990) and Carey (1989) chronicle diverse technologies' ability

to mobilize these qualities, and there are direct correspondences between their discussions of electricity, telephony and the telegraph and today's Internet.

We can see that panics and imperatives also managed to channel some of the earliest thinking about the Internet, sidelining more nuanced and productive ways of understanding how individuals and societies respond to and incorporate new communication systems. Moral panics have been associated with presumed negative effects of, for example, playing too many videogames or spending too much time on the Internet. On the other hand, convergence theories around the world sought to characterize the building of the Internet and held out promises of becoming Information Societies as long as we could wield the magical wand of infrastructure.

The idea of convergence was (and still is) a widely used catchphrase that glossed over the huge incongruities and unevenness of both the telecommunications terrain that was to be "converged" as well as the set of human capabilities that enable one to actually utilize the network. Convergence theories and language have occupied many researchers and policy makers. Government officials, economists and scholars around the world have been joined by infrastructure and computer and software companies to applaud the increased opportunities for economic development that convergent technologies suggest. Under the banner of convergence, the manifold philosophical and policy issues posed by the Internet were neglected, only to be encountered later as the superficiality of the notion of convergence became apparent.

When it comes to grappling with new communications systems on a social or national scale, the policy environment particularly relies far more on a language of technological capabilities rather than the messy arenas of social uses and mediating institutions that spring up to accompany technology-based opportunities. Using early Internet and convergence research as cases, this paper argues for caution in assessing new technologies lest we contribute to the moral

imperatives and the moral panics that seem to regularly accompany early brushes with the new. Perspectives that begin with a longer view and that explicitly acknowledge the social shaping of these systems can ameliorate the panics and imperatives that sometimes drive research and policy.

The early years: convergence and the digital sublime

As presented by Harvard's Anthony Oettinger, an engineer, and Daniel Bell, a sociologist – in two entirely separate contexts – the earliest connotations of convergence referred to linking the telecommunications network, meaning telephones and cable television systems, to computers (Oettinger et al., 1977; Bell, 1976). For both these theorists the implications of the converged network were revolutionary, and their persuasive essays contributed to an understanding of convergence as the bold-faced headline, the underscored, newest insight into the future, presented as inevitable, seamless and, in the U.S. at least, driven by the private sector.

Technological convergence history typically begins many discussions of the evolution of the Internet, and this is the history that one finds in the popular press. That history does not need to be repeated here - the origins of DARPA, the development of chips, packet switched networks, TCP/IP, the graphical browser. Manuel Castells (2000) has written several of the most compelling such histories. Suffice it to say that developments with digital systems, increasingly powerful chips and software, and the onset of the commodity network (abetted by graphical browsers initially, and other so-called "killer apps" afterwards) catapulted the significance of the technologically converged network, aided by trade magazines such as *Wired*, ever a cheerleader for the newest gadgets. New network configurations and technical capabilities prompted opportunities for innovation, and media, computer and information industries quickly set about reshaping and expanding the uses of the Internet, the pace accelerating in the 1990s and

achieving a plateau at the time of the dot.com bust of 2000. These histories are classic technology-driven narratives in which convergence is positioned as the fruit of miniaturization, silicon chips, and the almost "accidental" funding of the proto-Internet under the Department of Advanced Research Projects Agency (Hafner & Lyon, 1997; Norberg & O'Neill, 1997).

Numerous countries adopted convergence as a mantra, adding a sense of urgency to its realization. Their policy deliberations sought to create quickly the optimal conditions for achieving convergence, fearful of their countries being left behind. In the U.S., the Clinton Administration's National Information Infrastructure initiative in the 1990s pronounced the significance of convergence and insisted that America had to build converged networks, even adopting a "superhighway" metaphor to push the supposed benefits of convergence (National Research Council, 1997). Winseck (1998) demonstrates how the Canadian government adopted a convergence policy, one of its 1996 policy documents stating "Failure to seize the opportunity of using Canada's Information Highway will…result in reduced competitiveness and the loss of high-growth knowledge industries and high-quality jobs. The social costs…will be enormous" (Winseck, 1998). The European Commission likewise joined the surge; one of its 1997 reports noted about convergence "If Europe can embrace these changes by creating an environment which supports rather than holds back the process of change we will have created a powerful motor for job creation and growth, increasing consumer choice and promoting cultural diversity. If Europe fails to do so, or fails to do so rapidly enough, there are real risks that our businesses and citizens will be left to travel in the slow lane of an information revolution which is being embraced by businesses, users and by Governments around the World" (European Commission, 1997, 35). Convergence was coming, and it could be hastened with appropriate responses.

The Internet, the Information Highway, the Information Society, the Network Society all became synonymous with a robust and competitive future premised on converged telecommunications and computer networks. Alongside the policy community, whole industries as well as technological spokespeople such as John Perry Barlow and Howard Rheingold were instrumental in promulgating its significance. In Europe and Asia, the convergence of the telecommunications and audiovisual sectors was seen as the logical result of technological developments in digitalization and networking. Different countries adopted different mechanisms for achieving the converged network; Korea, for example, embarked on large government-subsidized infrastructure initiatives and tried to streamline its use by coordinating with various federal ministries. In many Western countries, the imperative especially targeted reducing regulation and smoothing the way for innovations such as the commercial Internet, to be led by the private sector (Hills, 2007). Cyber-libertarians such as Barlow and their technological determinism also contributed to deregulation: they believed that convergence as epitomized through the Internet meant that freedom was *engineered* into the network, that straightforward technical protocols guaranteed a collective and government-free cyberspace such that government intervention would be irrelevant (Mueller, 2010). That convergence was seen as primarily a *technological* feat doubtless contributes to the power of the metaphor to obfuscate the profound social and regulatory decisions it eventually provoked.

From the vantage point of ten years into the 21st century, convergence was superficially about two things: an array of access devices with attendant applications and a ubiquitous network. The proliferation of applications, mobile phones, and tablet computers in the first decade of the century deepens the purely technological connotations of convergence. The *New York Times* pointed out that in 2010 the stock value of Apple, riding the iPhone wave, crested

over that of Microsoft (Brustein & Belopotosky, 2010). This, it announced, symbolized the close of the computer era and the arrival of the consumer electronics era. In their totalizing power, such pronouncements perpetuate the notion of seamless and unproblematic convergence, in this case adding a buoyant and welcoming wave to the qualities of mobile access and Apple's iPhone. Yet, portrayals of gadget-driven convergence move attention away from the many ways the converged communications space relocates the forces of change. A consumer electronic era sounds like a happy era of individual freedom and choice. However, behind the array of appliances are profound economic and political determinations, ranging from illicit and harsh industrial manufacturing practices behind the supplying of the electronic tools, to dumping, to user repurposing of the devices to subvert their original designed intentions and high network prices, to peer-to-peer file sharing in response to locked down and expensive copyright practices. The joyous world of consumer electronics has a darker side when it comes to international manufacturing, copyright disputes, and even privacy.

With respect to the ubiquitous connectivity assumed to accompany convergence, the role of the telecommunications (essentially the telephone) industry has taken a quiet backseat to the flashy originality of the computer industry with its devices. However by no means has that backseat been inconsequential. The moral imperative to build a converged network contributed nicely to telecommunications industries' expansion plans, and it was able to benefit greatly from the public discourse not only in terms of justifying deregulation and moving away from government-established rates of return, but also in terms of receiving government funds to build out networks. However, underneath the ubiquity presumption the industries' performance began to be questioned. A closer look at the ubiquity claim reveals some additional vulnerabilities in the metaphor, especially when scrutinizing two facets: the matter of economic promises and

gains, as well as the Digital Divide. Both are implicated in how, or where, networks operate, and in the U.S. they were enlisted as justifications for public sector investment in the broadband networks undergirding the Internet and fulfilling convergence mandates.

The Bumpy Landscape of Convergence

With its private sector telecommunications industries, U.S. policy has for decades considered the marketplace an important arbiter of appropriate services and standards. Innovations in telecommunications services are driven by the private sector, introduced and deployed on a schedule that makes sense to shareholders rather than policymakers. Indeed, the "unregulatory" policies directed at the Internet and information services during the 1980s and 1990s and into the 21st century specifically espoused a belief in the wisdom of the market and the dangers of an interfering government hand in the evolution of the converged network (Gustafson, 2006). Some scholars interpret the Telecommunications Act of 1996 as well as the numerous changes to copyright law in the late 1990s as being simply U.S. social and economic systems adjusting to new technologies, not leading them. That is to say, legal structures were doing what they are supposed to do: respond to and integrate new opportunities into old institutions without fundamentally restructuring the locations and exercise of power or capabilities.

The dominant way convergence has been presented obscures disruptions to power and control spawned by new networks and their capabilities. As with displacement theory, convergence materialized imperfectly, and policymakers and researchers sought to reach beyond the logic of network integration in order to bind it more meaningfully to actual social and economic circumstances. Fundamental to re-thinking convergence was a debate regarding the appropriate role of the public and private sectors, a debate that is ongoing. Although many

countries had conceded that government policies regarding the arrival of the Internet and new networks were best if they allowed "nature" (the private sector, or unfettered technological innovation) to take its course, in countries such as the U.S., the actual building schedule and geography of the networks were predictably oriented to profit-making regions, leaving rural areas underserved and the metropolitan poor unable to buy into network service or lacking the digital literacy skills to make use of it. Moreover, the assumed economic outcomes trailing convergence also became subject to more skepticism. These two problems, the pace and direction of network build and associated economic consequences, deflate some of the expectations with respect to convergence.

With respect to network building, as documentation materialized demonstrating the unequal distribution of both network capabilities as well as user capabilities, fault lines appeared in the convergence discourse, especially regarding the role of the telecommunications companies. For example, Department of Commerce Digital Divide studies in the 1990s (e.g., the *Falling through the Net* series) responded to the popular imperative of assessing computer literacy alongside network convergence and assessed whether people did or did not have computers, or did or did not subscribe to the Internet (NTIA, 1995). These black and white measurement schemes and understandings are simple and easy to grasp, but even they dramatically misstated the situation and are far less usable in the 21st century. That the Digital Divide was, and remains, largely a proxy for social inequality was never directly addressed by any of these studies even though strong correlates between race, ethnicity, income and location (rural versus urban) and using computers and the Internet were evident. Numerous surveys from the Pew Internet and American Life Project amplified such findings, documenting the still-

present have-nots and the geographic disparities in convergence's progress (Pew, various years). The social contexts of digital literacy imperil convergence theory's utility.

As well, the data gathered by the FCC in the 1990s through 2008 on the progress of the "advanced network" in terms of actual network investment and bandwidth capabilities consistently showed what the agency considered to be "acceptable" progress even though academic criticism mounted that the data gathered were both misleading and inaccurate (Flamm et al., 2007). The form used by the agency, pursuant to its obligations under the 1996 Telecommunications Act, to track how well the advanced infrastructure needs were met had flaws that rendered several of its measures useless. Also, telecommunications companies were protected from detailed disclosures about the network builds under non-disclosure provisions offered by the FCC. Convergence as a techno-centric concept paid scant attention to the human and institutional dimensions of actual use of the network or the problems associated with motivating telecommunications industries to invest in the desired upgrades. The absence of transparency in how the regulator monitored network progress likewise damaged the power of the convergence impetus.

These network building criticisms mounted and ultimately contributed to dramatic shifts in the role of the regulator with respect to building a network that reached more people. By the time the FCC released a National Broadband Plan (2010), conventional convergence theory no longer held sway. Instead, the government committed to a long-term plan to subsidize and create mechanisms to redress uneven network deployment and to cultivate digital skills, direct responses to the failures of market-driven convergence. These same initiatives do *not* undercut market-led convergence efforts, and indeed there is no penalty for private companies associated with the onset of additional government funding in this domain. Quite the opposite, many

companies have received additional funds under the American Reinvestment and Recovery Act of 2009 to serve underserved markets (ARRA, 2009). From one perspective, the government's decision to fund network construction *helps* the telecommunications industries since it takes the pressure off of them to serve less lucrative populations using their own capital. Government interventions underscore normative convergence theory's limitations. The convergence framework lacks the nuance to tackle difficult questions pertaining to incentives and rewards.

On the matter of rewards and economic consequences, convergence efforts have been aided consistently by a trenchant and widespread discourse espousing the economic benefits of broadband deployment (see for example Lehr et al., 2006; Strover, 2011). Indeed, the stimulus plan offered by the Obama Administration in 2009 prominently paraded economic benefits associated with an investment in the converged network; the ARRA legislation explicitly prescribes that it should "stimulate the demand for broadband, economic growth, and job creation" (ARRA, 2009, Title VI, Section 6000). Expectations of economic payouts are typical in several countries adopting broadband investment policies to achieve convergence. It has become clear, however, that the economic benefits accruing to broadband investment are anything but straightforward, particularly with the challenges of providing services to the least populated and poorest segments of the country. One simple explanation is that the highest returns have *already* been realized in the most lucrative markets, which benefited from convergence early on; the remaining markets have various problems and difficulties that make economic returns more problematic (Strover, 2011). In one of the most comprehensive examinations of the returns to investment in converged networks, Greenstein and McDevitt carefully analyzed the historical returns from broadband investment and concluded "that non-private economic gains from [government investments in] deployment would have to be substantial to justify large

subsidies. Indeed, [our] study stresses that it is an open question whether many high-cost areas would or could pass such a social cost/benefit economic benchmark. Further, this is an interpretation for why the National Broadband Plan stresses the social reasons for national subsidies (e.g., fostering public health, better education, and civic communication) rather than economic reasons (e.g., local growth and employment)" (Greenstein & McDevitt, 2011). In plain terms, the convergence imperative cannot account for economic benefits in all places at all times. The convergence endeavor has a life cycle that unfolds differently in different contexts.

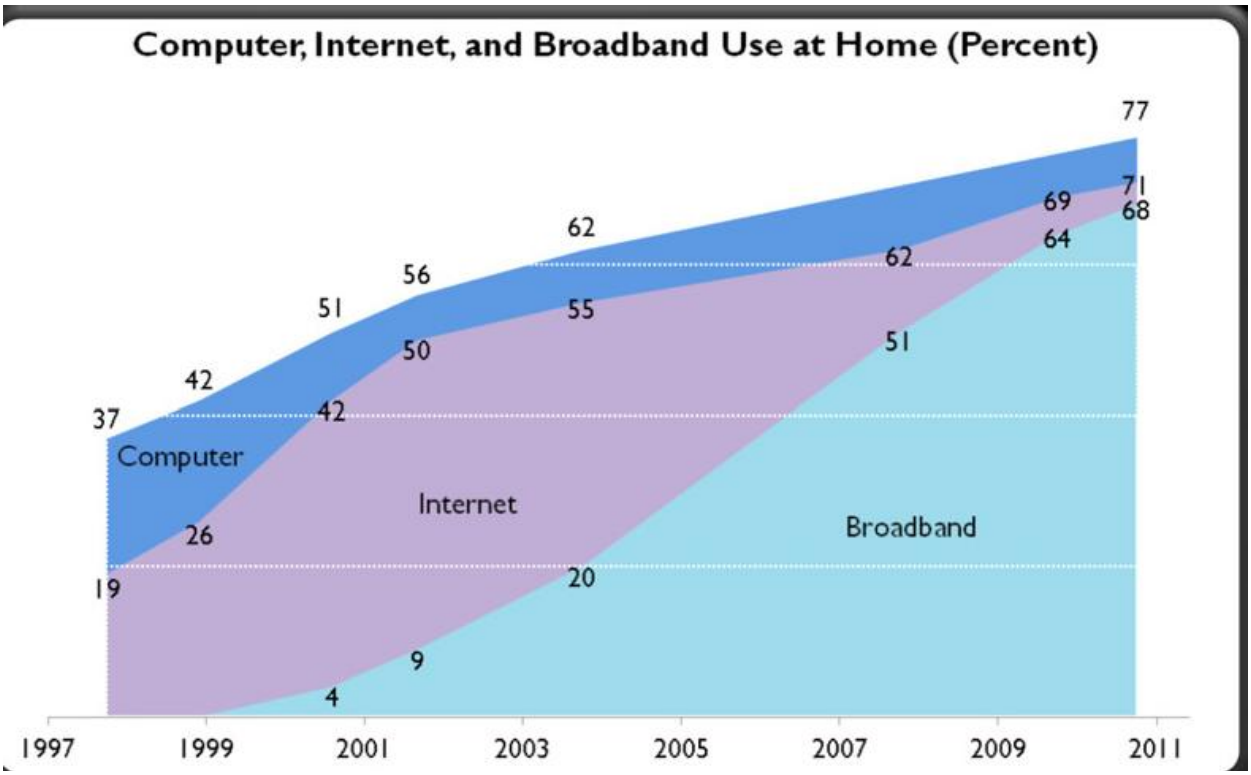
The difficulties realized with network building and economic benefits emphasize a major problem with the convergence proposition: it falsely conveys a sense of homogeneity. Along the lines of Thomas Friedman's *The World is Flat* (2005), convergence suggests a seamless, unifying topography in terms of both access and capabilities. Nothing could be further from the truth. A more subtly graded access and use environment, with various standards and capabilities and means of both adding content to or utilizing the Internet, complicates the notion of convergence. Convergence is in fact unfinished and uneven. The actual spatial dynamics of a converged network offer a picture of a very bumpy terrain with high and low points, with layers of services across several access mechanisms and in varied price categories, particularly in metropolitan regions. In other words, the popular notion of a converged network obscures multiple tiers of access, use, and possibility.

Getting the numbers: understanding the digital divide

To document some of the problems with convergence theory, one need only examine the history of the digital divide findings. As the significance of the Internet grew during the 1990s, the era of the "Information Superhighway" metaphor, more and more policymakers and critics

became interested in who was using computers, who had access to the Internet, and who actually used the Internet. These efforts were bracketed by growing concerns regarding the availability of access the Internet – in essence, where the "infrastructure" extended. In the 1990s, the focus was on cheap dial-up access, which morphed into a concern for affordable fixed line broadband access in the early 21st century. [By the second decade of the millennium, this concern has moved to mobile access, especially under the thrust of new FCC initiatives through the National Broadband Plan, taken up later in this paper.] The Federal Communications Commission, the primary regulator in this domain, embarked on a limited effort at monitoring the development of what it called "advanced telecommunications infrastructure," which was left to the private sector for development.

Figure 1 Computer, Internet and Broadband penetration over time



As Figure 1 demonstrates, the penetration of computers and Internet use at home grew rapidly across the past 15 years, and the path appears promising for rapidly expanding broadband Internet adoption. However, a demographic breakdown (Figure 2) of broadband adoption as of 2010 identifies certain groups that are on the "wrong" side of the digital divide; they include low income households, racial and ethnic minorities, seniors, rural residents and people with disabilities. In the U.S., about 80 million adults do not use broadband at home (about 30% of the population).

Figure 2: Broadband adoption within demographic groups, 2010

Group	BB Adoption (%)
National average	65
Low Income (<$20,000/yr)	40
Less educated (no H.S. degree)	24
Rural	50
Older (>65)	35
People with disabilities	42
African Americans	59
Hispanic	49

Source: FCC, National Broadband Plan, 2010

These became the normative identifiers for the digital divide – and they remain so. There appears to be a "hard core" percentage of the population for whom the Internet is meaningless: it is not useful, it is not worthwhile, and it has no relevance for their lives. These are typical of the responses people provide when confirmed this result in repeated surveys. Access is not an answer for this population, and indeed, they see no problem!

Public policy during this the 1990s focused on conducting demonstration projects (many funded by the National Telecommunications and Information Administration under its Technology Opportunities Program) and deregulating telecommunications industries, the assumption being that deregulation would encourage investment in new network capabilities. The 1996 Telecommunications Act that structured deregulation was motivated by a pro-competitive ethos, although it did carve out one area for government intervention that is relevant to the digital divide: through its new E-Rate program, the FCC initiated an effort to enable schools and libraries to obtain high speed connections to the Internet as well as computers. E-rate facilitated a rapid increase in Internet access to schools: from 14% in 1996 when the Telecommunications Act was passed to 94% in 2005. Libraries connectivity likewise rose quickly, so that nearly all of the US public libraries offer free public access to computers and the Internet. Moreover, 71% of these libraries reported in 2008 that they are the *only* provider of free access to the Internet in their communities (ALA, 2008).

The E-rate program continues today, and it is largely deemed essentially for basic connectivity on the part of these important but often poorly-funded institutions. Several states also initiated their own digital divide-related programs to subsidize network deployment to public institutions, but overall their efforts were scattered and unsystematic.

After the 1996 Telecommunications Act, there was considerable investment in new and higher capacity networks on the part of cable and telecommunications companies, but the companies building them strategically targeted businesses and major population centers where profitability would be greatest. Hence even though overall broadband penetration grew, certain digital divides also grew. Moreover, the notion of a divide was exacerbated as new, bandwidth-intensive applications emerged and grew in popularity, introducing distinctions regarding the

quality of access: downloading graphics-intensive programs or video was impossible on dial-up networks (the typical access mode for 80% of the Internet users in 2002). With a political swing toward a pro-business, Republican Administration, the newly elected President Bush declared that the digital divide was no longer a major problem: the Administration's 2002 Report, A Nation Online, concluded that the mission of technology access was accomplished, justifying the elimination of many digital divide-related efforts (Department of Commerce, 2002). Hence, the single major federal program addressing the digital divide from 2000 to 2008 was E-rate, a component of Universal Service. The largely deregulated private telecommunications sector was in charge of broad network development for the country.

A New Era for Research and Policy: From Convergence to Meaningful Adoption

During the first decade of the 2000s, three additional factors reshaped some of the digital divide discussions. First, a growing chorus of criticism was directed at the private sector performance in building broadband networks. Critics argued that networks were not rolled out quickly enough, that they did not reach rural areas, and that prices were too high and speeds too low, and that there was little competition in last mile access. Second, an interesting context was provided by ITU data that began to show that the U.S., the birthplace of the Internet, was slipping lower and lower on speed and cost dimensions, as well as on overall population penetration. While debates raged regarding the quality of those data and the comparability of a large country like the United States with smaller countries that had evenly dispersed populations, the growing international disparities in network capabilities gained prominence in U.S. media.

Third, in spite of E-rate's assistance with funding hardware and cultivating the supply side of the equation, several critics and scholars realized that adoption did not necessarily follow from network availability. Investigations into household adoption factors and the individual "utilities" characterizing Internet use grew into a cottage industry of regression equations predicting broadband subscription and use (Choudrie and Dwivedi, 2006), and they showed persistence rural lags in broadband adoption (68% of non-rural Americans had adopted terrestrial broadband service as of 2010, compared to 50% of rural Americans), in part due to availability of the network but also due to other factors (FCC, 2010). Uses and gratifications measures, sometimes incorporated into a Technology Acceptance Model, explored motivations for using the Internet and how people were making decisions about whether or not to subscribe. Affordability kept turning up as a major reason for people not subscribing to broadband (Horrigan, 2009), alongside relevancy concerns. Research further illustrated that even "adoption" or subscription to broadband belied the issue of how well people were able to use the Internet, i.e., what skills they were able to bring to their use of the resource. Van Dijk (2005) and Harigittai (2005), for example, demonstrated the knowledge gaps and inabilities of younger people – people presumed to be digital natives! - to perform basic tasks on their computers and with their Internet connections. Horrigan (2009) also found that negative attitudes toward the Internet's privacy and security significantly dampened people's enthusiasm for broadband. The community setting for broadband access emerged as influential: a multi-year field experiment investigating the impact of wireless broadband access found that the extent to which communities committed to demonstrations, public exposure of Internet capabilities, and training opportunities had a positive effect on broadband use (LaRose, Strover, Straubhaar and Gregg, 2011). Such work initiated an understanding of the digital divide that went well beyond access

and even beyond the act of subscribing to broadband or being able to use a computer or the Internet. They pointed us toward indicators that move beyond "hours of use" or "feelings of Internet self-efficacy" metrics as gauges of the digital divide and toward a deeper understanding of where this technological innovation, the Internet, fits among broader skills, life goals and even community settings.

In response to these findings, the Obama Administration moved proactively to use over eight billion dollars in government funds under the American Reinvestment and Recovery Act of 2009 (ARRA) to (1) finance broadband buildout to the areas that seemed to be left out of private sector plans (The Rural Utilities Service's Broadband Initiatives Program; (2) to create more capacity for middle mile connections so that rural carriers had more choices and presumably cheaper costs when linking to backbone networks (NTIA's Infrastructure program); (3) to invest in public computing centers to serve communities that lacked expertise, financial resources, and Internet options, and to accompany these settings with training programs (the Public Computing Center and the Sustainable Broadband Adoption programs with NTIA). This new government investment reinvigorated community efforts to both understand and remedy broadband access and utilization, and catalyzed more attention to a deeper understanding of the digital divide's dimensions.

However, it would be incorrect to chronicle these efforts without acknowledging the broader political and technological shifts ongoing by the end of the first decade of the millennium. If the Obama Administration gave a green light to fresh government investment to redress service gaps that were a byproduct of the commercial system's sidestepping what it assessed as unprofitable regions, so too the development of wireless telephony and wireless broadband access technologies, alongside a vibrant and innovative domain of Internet services

and applications, underscored how the broader regulatory setting was simply antiquated. When the Congress directed the FCC in 2008 to come up with a plan for broadband, it probably did not anticipate receiving a blueprint that proposed to alter the foundations of telecommunications regulation in the U.S. Schemes for supporting less profitable (or unprofitable) telephone companies, for regulating access to middle mile facilities, for maintaining the code of universal service – all this and much more have been subject to scrutiny in the national Broadband Plan, and the result has been massive changes, now ongoing, in the FCC's regulatory scheme. The most significant for my purposes here concerns rearticulating universal service as broadband service. Fettered by a definition that made just voice the object of universal availability, the universal service standard badly needed to be updated: voice connections are, after all, simply an "app" in the IP world. To enable new support mechanisms for broadband universal service, the Broadband Plan gathered fresh data and deployed trenchant economic analyses in order to add an empirical, data-driven side to this policy that is unequalled in past history. To that end, the FCC enabled a wide scale mapping endeavor so that data on where connectivity is provided and at what speeds would be public knowledge. It is in the process of altering support mechanisms that undergird service in high costs areas, and emphasizing new, important services such as rural health care in the telecommunications mix.

One of the most innovative regulatory experiments regarding universal service has recently been announced: a competition to identify the best ways to increase broadband adoption among low income Americans. The agency is running a $25 million pilot program to investigate how projects that represent partnerships between eligible telecommunications carriers and researchers can gather data bearing on the question of best practices to encourage broadband provision to low income households (FCC, 2012). They envision these as field experiments that

should include control groups, essentially espousing a laboratory approach to policy. Much as economist Jim Manzi (2012) argues in his book Uncontrolled, this procedure would enlist the strengths of experimental design in the interest of designing optimal policy solutions to a problem that has been mired in opaque monetary transfers detached from performance metrics.

As we embark on new and pragmatic ways to resolve policy issues such as the digital divide, the research community is stepping up with improved understandings of how broadband utilization is made meaningful to individuals, households and communities. Initiating studies in locations as diverse as public libraries, tribal lands, Alaskan villages, inner city neighborhoods, and small, rural towns, broadband adoption and digital inclusion is now seen as enmeshed with health, employment, family, and civic engagement. No longer is the technological innovation we refer to in shorthand as the Internet bounded by the hard edges of fiber or cable, or the softer edges of IP protocols; rather, it is embedded in social systems, social institutions, and everyday practices. In this, policy and research approaches to the digital divide are entering the new chapter of "meaningful adoption" with attention on broader contextual arrangements that condition how we interact with the Internet and everything that it means and does.

The convergence frame was perhaps useful for galvanizing attention but not for actually grappling with the problems presented by a new network model and a new model of what digital access and digital divides mean. Whether the policy and regulatory apparatuses around telephony topple as voice becomes just one "application" over broadband, whether the vitality of peer-to-peer networks requires that incumbent industries scramble for new points of control, whether government investment in networks justifies government mandates for openness, all of these questions call attention to the opportunities to actively and communally reconstruct our communications environments and to seek more meaningful ways of understanding how we

interact with technology and how we can mobilize its resources to broad improvements to our collective quality of life. Opportunities for reshaping our cultural spheres proliferate, as do chances to use the Internet for contradictory, non-uniform outcomes. If in terms of actual industry practices, social contexts, and the range of possible institutional responses, the convergence concept probably has masked more than it has illuminated, we are at a new point in our policy that is more data-minded, empirical, but also visionary than ever before.

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