Investing in Broadband Evaluation: Guiding Policy & Innovation for the Future

How we address the broadband challenge has been called *the* most important infrastructure challenge of the new century by the National Broadband Plan. High-speed Internet can connect remote communities, help coordinate and streamline health care services, enable our children with unparalleled access to learning opportunities, and spark and support innovation in numerous fields.

The challenge, however, is understanding what works and why across all of these important uses of broadband technology. Program evaluation can answer this need, especially if it is built into new programs and policies from the start.

Broadband is indeed generating new ways of working and living, but we do not yet fully understand how to maximize its positive social and economic impacts. To better understand these impacts, we need more effective evaluations at various stages of implementation. Policy planners might take a lesson from Silicon Valley, where the business development motto is "fail fast, fail early." Code developers, for example, work on only a small piece of code at a time and test it frequently to ensure it is working as hoped before moving on to the next piece of code. The success of this approach turns on regular evaluation. Being able to spot problems early saves money and time later. That same logic could be applied to broadband, if smart evaluation models were built in to pilot programs, then more would be learned about how it does or does not benefit low-income populations, health care, education, and e-government, and how to maximize its benefits.

Given broadband's transformative potential, the first question should be, can we afford *not* to learn from experience? Without a smart evaluation dimension to any broadband investment, resources may be wasted, new problems may be created, and opportunities for improved practice may be lost.

The Moment Is Now

The National Broadband Plan developed by the Federal Communications Commission (FCC) defines a vision for social and economic transformation with high-speed Internet technologies. Even as the Broadband Technology Opportunities Program investments end, new investments in broadband applications in health and education, across public and private sectors, and different levels of government will emerge. Federal and state policymakers have an opportunity to advance public policy goals at this critical moment by supporting evaluation of broadband innovations across places, policy areas, and over the long term.

About the Authors: The Research Roundtable on Broadband Evaluation is a group of researchers working to promote effective evaluation to study the policy impacts of broadband technologies. We represent evaluation researchers from across disciplines and areas of expertise who are committed to building a research community around broadband, and to understanding the social and economic impacts of these new technologies and the practices that can maximize them. We are interested in working with other academics, policymakers, and practitioners to promote and enhance broadband evaluation with rigorous research that draws on different disciplines and methods. Just as broadband technologies are innovative, so must be our approaches. We must integrate different types of expertise in evaluation research, technology, and knowledge of the processes in the different policy areas where broadband is being deployed.

Research Roundtable on Broadband Evaluation

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Broadband's Effects Reach Far Beyond Faster Internet Connections

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Broadband's speed enables innovative application of information technology across a wide range of policy areas, with the promise of generating important benefits for individuals and for society. In large cities, high-speed networks can improve the management of energy resources and help conserve energy during peak times. They can provide real-time information for users of mass transit, increasing the efficiency and usability of such systems and diminishing the environmental impacts of automobile use. Homeland security and public safety can be enhanced by rapid transmission of information, including videos, across jurisdictions. Local economic development may be bolstered if businesses can take advantage of teleconferencing, advanced manufacturing processes, and "big data" applications.

Better outcomes for health and education are also envisioned through broadband. High bandwidths are necessary for the resolution required to examine patients remotely or to share x-rays and other records, connecting major health research centers with clinics in underserved urban and rural communities. Schools with high-speed networks can experiment with new educational approaches using a variety of devices for more individualized learning.

Realizing the potential social benefits of broadband also depends on the breadth and inclusiveness of networks and technology skills in the community. Students, teachers and parents must have the technical knowledge and broadband speed to effectively communicate between classroom and home. Workers must have the ability and access to look for jobs and find training to gain new skills. Citizens must be able to access government services and information online to contribute to their communities and make informed personal decisions about healthcare or education.

For these reasons and more, we need to know how best to employ these powerful new technologies, discovering the policies and practices that are most effective.

Identifying What Works & Why: Process, Outcome, & Longitudinal Evaluations

Rigorous third-party (or external) evaluations are needed to untangle the complex interactions between technologies and human behaviors and to pinpoint broadband's singular effect on outcomes, as well as the processes that lead to them. Broadband is more than networks and infrastructure. Context and use matter, including the behavior of individuals and organizations. Formative evaluations, outcome evaluations, and longitudinal studies can document whether, why, and how programs succeed, ensuring that money invested in broadband is well-spent.

As new programs are being carried out, **formative evaluations** can help to diagnose problems and inform modifications. They can also highlight best practices for how such innovations can be implemented. Policymakers sometimes view evaluation as a cost that competes for resources needed for carrying out the program. But it is precisely because budgets are tight and resources are scarce that evaluation is needed to maximize the return on broadband investment. Formative evaluations can provide early feedback so that midstream corrections can be made cost-effectively. Such formative evaluations also provide information on effective practices and can lead to more efficient programs.

Partners in Chicago's Smart Communities BTOP SBA program, for example, used formative evaluations in planning for the last half of the program's implementation. Based on data about program participation and interviews with staff contained in the formative evaluation, the team made changes to the

Business Resource Network and portals. The evaluation also highlighted the strengths of the existing community relationships that smoothed implementation and the program's responsiveness to different needs across neighborhoods. This suggested more general lessons for good practice.[1]

In addition to formative evaluations, **outcome evaluations** provide information on whether the program achieved its goals, what should be done in the future, or whether the outcomes were worth the resources invested. For example, initial outcome evaluations of technology training programs can address near-term results such as increases in Internet use, or the different activities that new users pursue online. Do new Internet users look for jobs and find them more readily than individuals who are not online? Do parents who receive training communicate through e-mail or social media with their children's teachers and become more involved in their children's education than before?

The value of outcome evaluation to inform policy is illustrated by recent research on crime prevention strategies. In a number of evaluations using randomized experiments, researchers have found that extra policing of "hot spots" is effective in reducing crime. Contrary to the expectations of practitioners, who believed that focusing on some areas would simply move criminal activities elsewhere, the evaluation revealed that crime is evidently less mobile than commonly believed.

Evaluation research also can show why changes occur. For example, New York City has enjoyed a reduction in crime rates at the same time that it has increased spending on policing, but the lack of evaluation research has left policymakers and scholars unable to say what exactly is being done with the increased spending that may have caused this trend.

Program evaluations also can inform decisions on alternative uses of budget resources. Studies show that spending on policing is at least four times more cost-effective for crime prevention than investments in prisons.[2] Similarly, broadband evaluation could identify the most effective practices for training or compare the costs and benefits of gigabit networks across different types of communities. In the Digital Promise education initiative, a commitment to rapid and rigorous evaluation includes randomized experiments on the effects of Khan Academy classes and other innovations such as flipped classrooms in school districts. Evaluators are tracking schools serving as demonstration projects or "proof points."[3] These may help policymakers and others to understand not only whether these classes or other learner-centered strategies are effective, but also why, and under what conditions.

Although the policing studies indicate the importance of outcome evaluation, other questions require **longer-term longitudinal evaluations**. Sometimes the most important effects of broadband are not visible for a number of years, until organizations or individuals have had a chance to learn about and use the new technologies. And ultimately, it is the long-term effects that we care about—increases in graduation rates, incomes, employment, reduction of emergency room visits, or improvements in health from telemedicine, for example. Tracking the long-term impacts of BTOP investments is needed, even as the programs wind down. Without long-term analysis, we run the risk of concluding prematurely that technology has had little impact or only a short-term impact. The effects of computers and information technology on gross domestic product were not apparent for many years for this reason, and we can expect lagged effects in other areas as well.[4] Without long-term, longitudinal studies, we are unlikely to know whether investments in broadband have led to real change in employment, health, or education.

To understand fully the social and economic impacts and the processes that lead to outcomes, longitudinal studies are necessary in at least some strategically selected programs where the envisioned benefits are greatest or most critical. Large-scale programs, such as national initiatives, may fit this profile, although smaller programs may also garner support from foundations for long-term studies.

[1] Mossberger, K. (2012). *Smart Communities—Formative evaluation.* Available online at www.smartchicagocollaborative.org/smart-communities-formative-evaluation-report/

[2] Tierney, J. (2013, January 25). Time and punishment: Prison population can shrink when police crowd streets. *The New York Times*. Available online at www.nytimes.com/2013/01/26/nyregion/police-have-done-more-than-prisons-to-cut-crime-in-new-york.html?ref=science&_r=0

[3] www.digitalpromise.org/initiatives/proof-points/, www.digitalpromise.org/initiatives/league-of-innovative-schools/overview/, www.digitalpromise.org/initiatives/research/

[4] The well-known productivity paradox, highlighted by economist Robert Solow, referred to the apparent lack of impact of information technology investments on GDP for many years. See Lehr, W. (2012), Measuring the Internet: The data challenge. OECD Digital Economy Papers, No. 194.OECD Publishing. http://dx.doi.org/10.1787/5k9bhk5fzvzx-en

Evaluation Research Must Be Built into Programs from Their Inception

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When evaluation is undertaken as an afterthought, it may be too late to collect meaningful data. It is necessary to gather baseline data at the start in order to measure change, comparing conditions at the beginning and end of the program. One of the objectives of program evaluation is to disentangle the effects of the program from other influences, that is, to determine whether changes can be attributed to the intervention. Evaluation designs using random assignment or control groups address this issue and provide stronger evidence on outcomes. But these elements need to be planned from the beginning.

Planning for evaluation can include both qualitative insights and quantitative data at different points in the program's development, as shown by the evaluations for the Clinical and Translational Science Awards of the National Institutes for Health. These evaluations include stakeholder meetings, field visits, analysis of publications, and surveys.[5] The information from evaluation is so valuable that funders such as the National Science Foundation and the National Institutes of Health ofte require evaluation to be included in large-scale proposals and budgets. Evaluation results appear in annual reports, and project leads must respond to recommendations from external evaluators. These requirements have evolved in response to demands for accountability, better management of projects, and cost-effective use of resources.

To track the effects of broadband investments over the long term, more budgetary resources must be allocated for public-use data as well, such as the Internet supplement to the Current Population Survey and the American Community Survey. We have the opportunity to collect deeper and more selective data in areas that are important for policy objectives and to support panel studies that follow long-term outcomes. To make the best use of the information, greater capacity is needed to analyze data within government agencies, as are more partnerships with the academic research community. This capacity can be enhanced with more funding for academic evaluations through federal agencies and greater support for further research through the National Science Foundation and other granting agencies. State agencies also have an interest in supporting university research that tracks the impact of broadband investments within their borders.

No single study can answer all of the questions that are relevant for broadband policy. There is a need consistent commitment and support of evaluation, large and small, across different policy contexts and in various types of communities. There is a need to share tools for implementation and evaluation, including logic models, metrics, approaches, and methods. There is a need to share information across researchers, practitioners, and decision makers. **The National Science Foundation or other federal agencies might provide mechanisms for such**

[5] www.ncats.nih.gov/ctsa_2011/ch7.html

As Public-Private Broadband Projects Progress, Evaluation Will Be Key

There are many new programs that should also be studied if we are to effectively build efficient systems that have a positive impact. Municipal governments in cities like Seattle and Chicago are devising their own plans for improving high-speed infrastructure for economic development. Google Fiber in Kansas City (on both sides of the river) is moving forward with its private-sector experiment. The FCC has just announced support for gigabit networks in other cities. Through programs such as U.S. Ignite and Gig-U, institutions of higher education are promoting superfast broadband for research. The National Broadband Plan called for assessment of BTOP, including tracking of outcomes, the creation of a panel of experts to advise on assessment, and longitudinal studies.[6] These are recommendations that should be followed in the future, with the continued development of broadband policy.

Other programs that would benefit from evaluation include the pilot programs that foundations support for training and innovative uses of broadband. In the private sector, Internet Essentials has provided lower-cost alternatives for eligible households, and its effects can point to new ways to expand reach. Likewise, the FCC is piloting reforms to the universal service fund programs for low-income consumers, and programs like Connect2Compete. States regulate broadband services, implement universal service fund programs, and promote broadband for economic development and community anchor institutions. There are many other efforts that will be launched in health, education and other areas. All of these efforts should to be evaluated if public policy is to use funds efficiently and effectively.

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How Policymakers Can Promote Good Practice Going Forward

The federal government has already invested more than $7 billion dollars in broadband through the stimulus programs, and this amount will be multiplied many times over in new networks and applications developed across public and private sectors. The rapid and rigorous evaluation espoused by Digital Promise deserves wider attention in other areas supported by broadband use. Given the breadth of possible impacts of broadband across policy areas and for different communities and populations, evaluation of continued broadband innovation is critical for governments and other organizations undertaking new initiatives.

The following are several options for how can policymakers, programs, and funders can promote good practice through evaluation:

- Build evaluation into program design from the beginning. Setting aside funding and involving evaluators at the beginning can improve data collection and program design, leading to more efficient use of resources and more effective evaluation.
- Include long-term studies of impacts. The effects of infrastructure and training may be visible only with time.
- Invest resources in third-party evaluations, which provide a more objective view of the program and expertise.
- Ensure that programs and sponsors are open to hearing about problems, mixed results or a lack of significant outcomes. While such results may be politically sensitive, important lessons can be learned for future decision-making.
- Fund advances in public-use data on broadband and support academic research and evaluation.
- Ongoing federal support for research on evaluation.

[6] FCC 2010, National Broadband Plan, Appendix A (Recommendations A.1-A.4).