



Information Technology

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Governor

KEITH WERNER
*Secretary of Information Technology
State Chief Information Officer*

To: The National Telecommunications and Information Administration
From: Jeffrey Sural, Amy Huffman, and Janine Parker of the [Broadband Infrastructure Office](#), an office of the North Carolina Department of Information and Technology
Subject: National Broadband Research Agenda Suggestions
Date: October 11, 2016

The North Carolina Broadband Infrastructure Office (BIO) makes the following recommendations to the NTIA in response to the request for comments issued on September 9, 2016. Recommendations are presented in categorical order as presented in the order.

BIO's first recommendation, however, is to consult the recommendations found in the "Symposium Report: Findings from the Research Roundtable on the Economic and Community Impact of Broadband," written by Edward Feser, John Horrigan, and William Lehr on behalf of NC Broadband (BIO's predecessor). The report (attached) is the result of a research roundtable symposium in December 2012 attended by nearly 40 of the country's premier broadband experts and researchers. While over three years old, most of the research recommendations found in the report have yet to be addressed. Before new research questions can be asked, those found in the report should first be answered. Should the NTIA require more information on the research questions proffered in the report, BIO recommends NTIA consider convening a second roundtable discussion inviting attendants who participated in the first roundtable and any additional researchers and experts NTIA identifies.

All topics/questions submitted by the NTIA are listed, however, BIO did not respond to every question. BIO's specific recommendations are listed after each topic in italics beginning on the following page.



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I. Broadband technology

- a. Question: What are the critical data and research needs in the areas of broadband technology and innovation?
 - i. *Need data and research on what the most promising new emerging (like balloons, drones, planes, etc.) broadband delivery technologies are*
 1. *Need data on how reliable these emerging broadband technologies are.*
 2. *Need data on whether these emerging technologies will be able to deliver scalable, reliable speeds.*
 - ii. *Need data and research on what the most promising technologies that can enhance broadband speeds (i.e. Devices, platforms, etc.) are.*
 - iii. *Need data on how much private funding (i.e. VC, angel funding, etc.) is invested quarterly and annually in companies dedicated to enhancing broadband technologies.*
 1. *Need data on how this compares to other sectors.*
- b. Question: What specific technology research proposals, and associated methodologies, should be prioritized to support the advancement of broadband technology? And why?
- c. Question: What specific technology research proposals can support federal efforts to foster the access and adoption of broadband technology across rural areas, and other unserved and underserved segments, such as population groups that have traditionally under-utilized broadband technology (e.g., seniors, low-income families, persons with disabilities)?

II. Broadband Access and Adoption

- a. Question: What are the critical data and research needs in the area of broadband deployment and access?
 - i. *Need more granular (to census block level at least), more timely (current data is at least a year behind), consistent availability data released to states twice per year.*
- b. Question: What specific research proposals, and associated methodologies, regarding broadband access should be prioritized? And why?
 - i. *Need legislative evaluations at federal, state and local level to determine what impacts broadband related legislation has on broadband availability.*



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- c. Question: What are specific areas for federally-supported research as related to key market trends that impact broadband deployment, including business models, public-private partnerships, sustainability drivers, the removal of regulatory barriers?
 - i. *Need published case studies, program evaluations, etc. to show what the most effective public-private partnerships in expanding broadband availability are.*
 - ii. *In depth project/program evaluations on existing federally funded programs intended to enhance access.*
- d. Question: What are the critical data and research needs in the areas of broadband adoption and utilization?
 - i. *Need timely, consistent adoption data granular to (at least) county level. It's necessary for any sort of research and policy development and not currently being made available to the states.*
 - ii. *Need in depth project/program evaluations on existing federally funded programs intended to enhance broadband adoption and utilization.*
- e. Question: What specific research proposals, and associated methodologies, regarding broadband adoption and utilization should be prioritized and why?
 - i. *Need comprehensive legislative evaluations at federal, state and local level to better understand what impacts broadband related legislation has on broadband adoption and use.*
 - ii. *A research study on how broadband access and adoption changes economic and education outcomes for low to moderate income families.*
 - iii. *A research study to answer research question: How does mobile adoption impact digital equity?*
 - iv. *A research study to answer research question: What is broadband's impact on health outcomes? Does it differ based for different demographics, regions, etc.?*
 - v. *A research study to answer research question: Is adoption of mobile broadband a complement or substitute to wireline adoption? Is it different for different demographics? Does it differ between rural/urban populations?*
- f. Question: What specific research and data are needed to understand how rural residents and other population groups that have traditionally under-utilized broadband technology (e.g., seniors, low-income families, persons with disabilities) can better adopt and broadband?
 - i. *Need research on question: How much is the wide variety of devices/differing platforms/operating systems available to consumers impacting broadband and device adoption?*

1. *Does it differ for different demographics? Different regions? Rural and urban residents?*
- ii. *Need research on question: Is there an optimal device/platform/operating system for new adopters?*

III. Socioeconomic Impacts

- a. Question: What are the critical data and research needs in the area of broadband and its economic and social impact?
 - i. *Need annual data on what the microeconomic impact of broadband is on households.*
 - ii. *Need annual data on what the macroeconomic impact of broadband on communities, counties, states, and the country.*
 - iii. *Need more specific research on small business broadband adoption and utilization and how it impacts their success.*
- b. Question: What specific research proposals, and associated methodologies, regarding the socioeconomic impact of broadband should be prioritized?
 - i. *Need updated, annual data on the micro and macroeconomic impacts of broadband.*
- c. Question: are there specific socioeconomic research areas that can help measure the effectiveness of federal programs seeking to foster broadband access, adoption, or competition?

IV. Opportunities for Federal Leadership in Data Collection and Research

- a. Question: What opportunities exist to improve the sharing of research from federal research programs with external stakeholders (e.g. industry, academia)? Likewise, how can external stakeholders better share their research with federal agencies?
 - i. *The federal government should create and regularly update a portal to house state and local ordinances and regulations related to broadband can access for no cost.*
 1. *Portal should be user friendly, easily searchable and sortable*
 - ii. *The federal government should create and regularly update a portal to house published research on broadband availability, adoption and use that all researchers, states, etc. can access for no cost.*
 1. *Portal should be user friendly, easily searchable and sortable*
 2. *Could also provide a forum within the site where researchers can talk with one another, comment on their work, speak about their*



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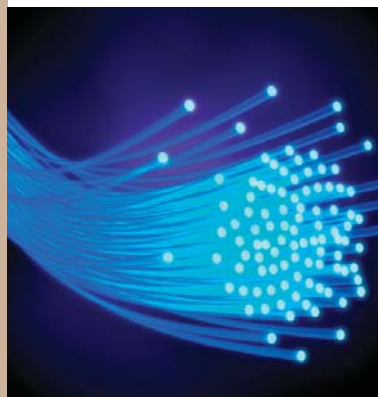
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- methodology, potential collaborations, etc. i.e. Something like a Slack channel.*
3. *At the very least the portal should provide way to contact researchers whose work is published in the site*
 - iii. *All federal agencies should embed digital focused research into their research with input from experts NTIA and FCC.*
 - b. Question: What are suggestions for enhancing cross-disciplinary collaboration in broadband research?
 - c. Question: Given limited federal budgets and existing research efforts led by industry, academia, and other external groups, what specific role should the federal government play in the area of broadband research?
 - i. *The NTIA should fund research conducted by cross-disciplinary collaborative academics or state researchers.*
 - ii. *The NTIA should aggregate and share best practices with researchers and states.*
 - d. Question: Are there opportunities to collect new broadband-related data or expand current data sets within federal programs that fund and/or produce research?
 - e. Question: What data (whether public, commercial/proprietary) would facilitate ground-breaking research related to broadband, if that data were to become available?
 - i. *Need granular (household level) data on fiber availability to determine where gaps are and how communities should plan.*
 - ii. *Data on where middle mile fiber routes are.*
 - iii. *Data on where last mile fiber routes are.*
 - iv. *Data on fiber availability to existing businesses, green sites, make-ready sites, etc.*
 - f. Question: What are possible changes to federal policies and programs that could enhance broadband research?
 - g. Question: What are recommendations for standardizing broadband and commonly-used demographic terms across the research community? How can these terms be operationalized to ensure comparability of data?
 - i. *NTIA should consult with other researchers/agencies/stakeholders who use common terms. Next, the NTIA should aggregate results then host a round-table/forum/crowd-source opportunity for stakeholders and researchers to contribute to establish a set of agreed upon definitions for commonly used terms and publish them as agreed upon, standardized terms.*

SYMPOSIUM REPORT: Findings from the Research Roundtable on the Economic and Community Impact of Broadband

December 7, 2012



Prepared for NC Broadband, a Division of
the North Carolina Department of Commerce

by Edward Feser, John Horrigan and William Lehr

March 2013

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ACKNOWLEDGEMENTS

This project has been funded primarily by NC Broadband's State Broadband Initiative award from the National Telecommunications and Information Administration (NTIA) at the U.S. Department of Commerce, and supports the ongoing efforts of state broadband initiatives across the country. To complete this work, NC Broadband partnered with four leading experts to help plan and facilitate the Research Roundtable on the Economic and Community Impact of Broadband.

NC Broadband would like to especially thank Jane Smith Patterson, a leader in technology and communications policy, for her lead role in coordinating this project, including the symposium and the resulting report. In addition, NC Broadband would like to thank Dr. Ed Feser, University of Illinois, Champaign-Urbana; Dr. John Horigan, Joint Center for Political and Economic Studies; and Dr. William Lehr, Massachusetts Institute of Technology; for planning and participating in the symposium, drafting of the initial Survey of Experts, and drafting of the report, with special thanks to Dr. Feser for his lead in writing the proceedings. This project would not have been possible without contributions from these experts. NC Broadband would also like to thank Professor Kenneth Wilson, in the Department of Sociology at East Carolina University and Rebecca Powers of the Community Research Laboratory at Eastern Carolina University, for their implementation of the survey process and analysis on the Survey of Experts (Appendix 3).

Appreciation and recognition is extended to the Trachtenberg School of Public Policy and Public Administration of George Washington University for providing an attractive meeting space and logistical support for the symposium.

This report is the result of a collaborative effort between NC Broadband of the North Carolina Department of Commerce and many leaders in the broadband, telecommunications and technology fields. NC Broadband would like to thank all of the subject matter experts including presenters, panelists and attendees, listed in Appendix 1, who contributed their time to attend this symposium, and gave their valuable information, ideas, thoughts and suggestions throughout the day.

Finally, NC Broadband recognizes the contributions of the following staff members for their leadership on this project: Deborah Watts, Senior Research Director and assistant coordinator for this project; Amy Huffman, Research Associate; and Samantha Jackson, Community Outreach Specialist. NC Broadband also thanks Tracy Howell, Accountant for NC Broadband, and the Fiscal Management Division of the NC Department of Commerce for their support.

TABLE OF CONTENTS

Executive Summary.....	3
Research Roundtable on the Economic and Community Impact of Broadband	5
Appendix 1. Research Roundtable Participants	10
Appendix 2. Roundtable Agenda	11
Appendix 3. Survey of Experts	15
Appendix 4. Bibliography.....	16

EXECUTIVE SUMMARY

In December 2012, a group of experts spanning disciplines and practice in the field of broadband policy met at George Washington University to discuss how the research community can better serve state and local policymakers and other stakeholders. This group of subject matter experts was convened by the NC Broadband Division of the North Carolina Department of Commerce to examine how best to measure the economic impact of state and national broadband deployment and capacity/adoption building efforts. The impetus for the symposium stemmed from the widespread view that there is a deficit of research, standards, and measurements to adequately inform the widely acknowledged view that broadband Internet is a driver of sustainable economic and community development. There was a strong consensus that broadband is critical infrastructure for community and economic development, but also agreement that the research community must tackle a series of important issues in order to better contribute to policymaking:

- Although the current state of broadband research is strong, it occasionally suffers from a “broadband is inherently good” promotional bias and has neglected analysis of broadband project failures and potential adverse outcomes associated with the ongoing transition to a digitally connected society. A better understanding of all outcomes—both positive and negative—and of the distributional effects of broadband will greatly inform evidence-based decision making.
- Although broadband’s impact on job creation is of obvious interest to many stakeholders, relevant impacts extend beyond employment. Additional research into how broadband may improve government service delivery, job training program implementation, civic engagement initiatives, and health care delivery would be of considerable value.
- More broadband research on a wider range of issues will require support and coordination from government at all levels (federal, regional, and local), as well as from industry and academia.
- More research is needed on the impact of specific broadband policies and investments at the margin, such as increases in broadband speeds and reliability, the use of new technologies, and the deployment of mobile in the place of fixed technology.
- More research is needed on the demand for, and use of, broadband. There is insufficient analysis of what drives demand among businesses and households in a more digitally connected society. A better understanding of demand drivers will help frame decisions on network design and investments in education and training intended to help users best utilize emerging applications. Usage-based/demand-side micro studies and other research designs that are more granular as to firm type, consumer type, and location are particularly needed.
- As policymakers and other stakeholders undertake new broadband initiatives, it is important to design program evaluation into project design. To date, there has been too little emphasis on program evaluation in broadband investments (whether undertaken by the public or private sectors). There are significant advantages to “designing in” evaluation from the start.
- Although empirical research has great value, qualitative approaches are appropriate, especially since broadband projects often result in institutional capacity building at the state and local level. That capacity can result in better decision-making about broadband projects. While that proposition is not proven, qualitative study may shed light on it.

- A byproduct of our connected and increasingly automated future will be increased availability of data and new platforms for real-time decision-making. Additional multidisciplinary research would help make sense of this onslaught of new data sources and analyses capabilities.

As to a roadmap for the future, the assembled experts focused on the following recommendations:

- Take into account the growing diversity of data sources. An example is greater exploration of how Big Data can be harnessed to answer policy-relevant questions.
- Engage in more technology forecasting and visioning of alternative futures.
- Systematically archive academic and non-academic studies in order to more effectively share lessons and findings.
- Support efforts to build institutional capacity to undertake the multidisciplinary research on the challenges of our increasingly complex broadband future. We continue to need research on economic impacts (jobs, economic growth), but we also must appreciate that economic impacts are complex, with important distributive and long-term effects (e.g., impacts on human capital development and intangible asset growth) and that broadband policy goals include social impact goals (e.g., quality of life, equity) that call for different data, metrics, and methods. We collectively need to build capabilities and research coordination to collect and share local, regional and federal studies and to build multidisciplinary expertise to answer the questions that will be important tomorrow but which we do not know about today.

On 7 December 2012, more than three dozen experts from the United States and abroad gathered for the day on the campus of George Washington University to discuss what is known and unknown about the economic and social impact of widespread broadband deployment and Internet access.¹ Present were economists and policy experts, government statisticians, leading academics and practitioners in the private and non-profit sector who have conducted relevant research, engaged in data collection, or developed an interest in broadband impact assessment, program evaluation, and measurement through the administration or management of broadband programs. Primary funding for the workshop came from the National Telecommunications and Information Administration (NTIA) at the U.S. Department of Commerce through an award to North Carolina for its State Broadband Initiative.² The symposium was funded as one of multiple deliverables for this award. The meeting was convened by NC Broadband of the North Carolina Department of Commerce.

Governments, companies and policy-makers need credible information to design broadband policies, including stimulus efforts. They need to be able to assess the return on investment expected from broadband access to consumers, businesses and other organizations. Although broadband Internet is widely acknowledged as a driver of sustainable economic and community development, the research approaches and measurement standards necessary to fully evaluate its impact are still developing. While considerable research exists, much more is needed as broadband continues to evolve and become more pervasive throughout the economy and society and as our dependence on it grows. The existing research highlights the importance of broadband, but is often based on partial, dated data and selected case studies that leave many important usage contexts under-explored and hamper efforts to extract general and specific lessons from broadband policies. The issues that confound analysis are even more complicated for investments that involve public-private partnerships. Given the unprecedented level of broadband investment by local, state and federal governments in broadband programs and data collection (including surveys and mapping), growing partnerships between private and public players, and the planning and capacity building work underway in many U.S. states, there is a real and pressing need for a serious examination of best practices for broadband data collection and program assessment. Careful measurement of the economic and social impacts of broadband is needed to properly design, target, and manage broadband policies.

In a series of structured sessions, speakers, panelists and members of the roundtable audience discussed the state of research and data collection related to the economic impact of broadband; identified gaps in the research record where attention is most needed; and debated the most promising avenues for improving research related to broadband economic and social impact assessment. Given the one-day structure of the event, the aim was to develop a high-level picture of future research priorities and needs, rather than to focus on the details of methodologies and techniques. Special attention was paid to the role states can play in advancing research to support evidence-based policy making and to the specific challenges related to informing strategies to strengthen broadband access and adoption in rural communities and among low income populations.

¹ A list of participants (Appendix 1), the meeting agenda (Appendix 2), a summary of responses to a pre-meeting survey (Appendix 3), and a bibliography of broadband impact research (Appendix 4) are attached. Additional information is available at <http://ncbroadband.gov>.

² NC Broadband, a division of the North Carolina Department of Commerce, is responsible for work under the *State Broadband Data and Development Grant* awarded to North Carolina by the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. As such, NC Broadband serves as the State Broadband Initiative for North Carolina. See <http://www.ncbroadband.gov> for more information.

This report summarizes the strongest recurring themes and associated recommendations that emerged out of the roundtable discussions. They are presented here in the spirit of offering a roadmap that may help shape the research focus of scholars and applied researchers as well as guide the allocation of research funding offered by public sector bodies at the national, state and local scales; non-profit organizations and foundations; and private sector stakeholders.

MAJOR FINDINGS AND RECOMMENDATIONS

Broadband must be viewed as critical basic infrastructure with important yet complex economic and social impacts.

The volume and quality of research on the economic and social impacts of broadband have increased substantially over the past decade. The availability of data useful for broadband impact research has also improved, both through mapping efforts at the federal and state levels and via surveys. The accumulation of research points to several broad findings: that the nature and quality of Internet access matters in terms of its net impact on growth; that Internet-usage and the proliferation of information technology drive productivity gains and economic structural change; that Internet access and use creates both winners and losers among industries and individuals; and that the links between broadband availability and economic growth are highly complex. Overall, the existing body of research suggests that broadband is best viewed as a kind of basic infrastructure that is necessary but not sufficient for economic growth. Its impacts vary widely by sector, location, and demographic category. How broadband is used determines its economic and social impacts, and its use depends on multiple factors in addition to the availability of broadband. As we realize the goal of ensuring the general availability and near-ubiquitous adoption of broadband services, the focus of policy will shift to promoting best practices in broadband usage and management in increasingly diverse usage contexts (business vs. home, fixed vs. mobile, rural vs. urban, old vs. young, healthcare vs. finance, etc.).

While understanding broadband's net economic and social impact on the macro economy will remain important, this has been too much the focus of existing research. The most pertinent questions are shifting to the ways broadband can be harnessed to meet a multiplicity of social and economic goals.

We need a better understanding of marginal effects and appropriate types of public intervention in ensuring broadband availability and use.

Many studies point to positive aggregate economic impacts of broadband. Far fewer investigate the impact of marginal improvements in broadband speeds, reliability, or other factors impacting users' broadband experience. Yet such marginal analysis is needed to properly evaluate the costs and benefits of public-sector and public-private efforts to further improve broadband infrastructure. For example, there is a dearth of research that compares alternative types of broadband infrastructure and that analyzes the social and economic implications of increasing use of mobile over fixed technologies. In general, more analysis is needed on the types of public intervention that are both appropriate and cost-effective for increasing the supply of broadband (e.g., regulatory reform, subsidization, public-private partnership models of deployment and service delivery, technical assistance to would-be providers, information provision, and demand aggregation, among other things). Such research may take multiple forms, including theoretical modeling from a public economics perspective or the empirical evaluation of existing interventions.

Broadband impacts are about more than jobs. More research is needed on a wider range of outcomes.

Much broadband research emphasizes net job gains. That is an important outcome. However, the increasing use of information technologies that are enabled with the availability of broadband creates other outcomes that have been the subject of less systematic study. On the positive side, those may include public sector cost savings associated with changes in service delivery (e.g., reliance on online service delivery over walk-in services); increasing rates of innovation driven by reduced transactions costs, easier interpersonal networking, and knowledge spillovers; contributions to human capital development through online training programs and learning options; and improved quality of life through greater access to healthcare in remote areas and increased community participation and civic capital. On the negative side, asymmetric access to broadband and skill-biased changes induced in the job market may accentuate economic and social disparities or dilute efforts to target economic development efforts to specific locations (e.g., if broadband intensifies competition for local dollars from more geographically distributed markets).

Broadband impact research needs to be more granular in terms of sector, demographics and geography in order to more effectively inform policy making.

Both the supply and demand of broadband varies widely by location, consumer-type, and firm-type. Industrial mix, demographics and location also interact in significant ways to affect net impacts and drive gains and losses. The policy relevance of broadband social and economic impact assessment depends on the disaggregation of effects across space, time and user type.

Broadband impact research needs to be more objective and more willing to examine policy failures and potential negative outcomes.

Many early studies of the impacts of broadband used general multiplier methodologies rather than cost-benefit or general equilibrium techniques, and many avoided the consideration of the opportunity costs of broadband infrastructure investments or the distribution of benefits among industries, large and small firms, household types, and locations. The focus on aggregate benefits tends to give much of the existing research a “promotional” flavor that extols the virtues of broadband and other information technology infrastructure but neglects consideration of the complexities of implementing projects effectively, maximizing the potential of the infrastructure, and widely sharing its benefits. Moreover, there are comparatively few studies of known broadband project failures; most case-study analyses tend to focus on successes and casual assessments of “best practices” are common. In fact, known failed or problematic projects and policies should be considered opportunities for analysis that has the potential to significantly inform policy making and implementation.

Important questions about the supply of broadband remain, but research that focuses on demand and use needs to be prioritized.

Considerable attention has been placed on where broadband is available, where infrastructure gaps exist, and how fast those gaps are closing with increased public and private provisioning of infrastructure and services. Recently, with the proliferation of state broadband mapping initiatives, better data on pricing and service quality are emerging that can enable even more refined analyses of broadband supply questions. While this work is important, the study of the demand side of the broadband impact question needs considerably more attention. This should include greater focus on: the factors influencing businesses of all sizes—but especially small businesses—to make greater use of online technologies; the changing influences on consumer and household use of the

Internet, disaggregated by location, race, ethnicity, income, and age; the types, rates, and diffusion of innovation in applications and services that make use of broadband; and barriers to broadband uptake and use among firms and consumers.

Soft capital and institution building are important, yet neglected, outcomes associated with broadband deployment efforts. They are a type of impact that deserves more study.

A neglected area in social broadband impact assessment is the potential value broadband infrastructure projects themselves generate as they are conceived and executed in particular communities, especially in smaller and rural communities that must undertake highly collaborative, multi-partner planning and implementation efforts to maximize the use of limited resources. Broadband projects may be viewed as an opportunity for institutional capacity building that makes possible the successful undertaking of subsequent public or public-private projects of other kinds. It suggests that there are policy implications to the particular form of implementation that broadband deployment projects take; additional research on this question (e.g., using data collected on BTOP initiatives) may help inform the design of broadband projects so that their institutional benefits are maximized.

Institutional and social capital effects are an example of a kind of impact of broadband deployment that is not easily assessed using quantitative metrics and methodologies. This underscores the need for the increased application and development of qualitative methods in broadband impact assessment.

There are too few well-designed program evaluations and too little attention to challenges related to the implementation of broadband-related policies.

Many states and municipalities are making significant investments in broadband infrastructure. Others have had significant broadband deployment and other related programs and policies in place for a number of years. The Broadband Technology Opportunities Program (BTOP) projects represent a growing set of “data points” on policy interventions and public investments. Such initiatives should be subjected to carefully crafted program and policy evaluations, using quasi-experimental and other research designs that are able to control for intervening influences on outcomes. Moreover, more programs should be designed with subsequent policy evaluation in mind, so that outcomes of deployment in selected communities and demographics can be validly compared with outcomes among firms, consumers, and communities that did not receive infrastructure or other policy interventions. More research must also recognize that for many public programs and policies, the relevant question is not one of net effects, but rather how the program or policy can be best improved or strengthened. Providing that kind of evidence requires attention to the challenges of broadband and Internet program/policy implementation.

Broadband researchers need to take better advantage of a growing diversity of data sources, including Big Data, but they must do so in a reflective way, to ensure quality, comparability and improvement of data over time.

The national broadband mapping effort, as well as the rise of Big Data, has resulted in a wealth of new data that can be used to study the impact of broadband. Big Data, itself a byproduct of an increasingly Internet-connected world, creates considerable opportunity to undertake impact analyses that are far more granular as well as timely, therefore holding the prospect of informing public policy decision making and public program management in more immediately useful and

therefore powerful ways. However, these new data sources bring with them a need to address how best to manage, quality-control, interpret, and share the data that are collected. Interpreting new sources of data from clickstreams, social networking, and sensors will call for new analytical frameworks and models. Benefits associated with timeliness and granularity may be offset by uncertainties associated with quality and reliability. Data policy questions will include those related to privacy of consumers and businesses whose online behavior is mined for information.

We need more visioning of alternative futures, more technology assessments, and greater use of technology forecasting and foresight techniques in broadband impact research.

Researchers studying the social and economic impact of broadband and Internet-enabled technologies and services need to ever be mindful of the rapid rate of innovation and technological change in this arena. Certainly one factor limiting the value of broadband impact research to date has been that economic, social and technological conditions have often changed dramatically from the period the most “recent” data are available for analysis. Time trends are also unstable, so that past trends cannot be readily assumed to hold even for relatively limited periods of time. These problems are endemic to research on technologies and services with a high rate of innovation. However, researchers should not simply seek to understand the impact of existing technologies, services and behaviors; they might also make greater use of technology forecasting and foresight techniques to speculate about future changes in technologies, services, supply, demand, etc. and their associated impacts.

The systematic archiving of academic and non-academic impact analyses, evaluations and other studies undertaken at the federal, state and local levels should be the first step in an effort to build a stronger community of impact analysis researchers. Through the sharing of results, innovation in impact assessment and evaluation, systematic comparisons, and the collective understanding of impacts and remaining research gaps would accelerate.

Studies of broadband social and economic impact are proliferating, particularly from non-academic sources. Many are case studies and casual evaluations that are not widely disseminated. The federal government, states and municipalities are experimenting with novel policy interventions on both the supply and demand sides of the broadband infrastructure question. Many of those interventions are being documented through descriptive case studies and informal evaluations. Somewhat less frequently, they are being assessed for impact using rigorous policy evaluation techniques. In the case of both types of studies, the volume of accumulated results is growing but the accessibility to the bulk of the work remains idiosyncratic and incomplete. Only rarely do such applied studies result in academic journal articles that are readily found through usual scientific search engines and databases.

A shared repository of case study-based and other impact evaluation studies would help accelerate the collective understanding of impacts, innovation in impact assessment methodologies, the dissemination of policy lessons, and the conduct of meta-analysis and other useful systematic comparisons. The archive might also serve as the core of a hub around which researchers could better coordinate and share research plans, designs, methodologies and results. To achieve this goal would require collective agreement among the community of broadband researchers around common frameworks and standards for documenting their work.

APPENDIX 1. RESEARCH ROUNDTABLE PARTICIPANTS

ATTENDEE	AFFILIATION (AS OF DECEMBER 7, 2012)
Robert Atkinson	Information Technology & Innovation Foundation
Angie Bailey	NC Broadband
Jim Baller	Baller Herbst Law Group
Charles Benton	Benton Foundation
Laura Breeden	Sustainable Adoption, BTOP, NTIA
Mike Byrne	Federal Communications Commission
Dale Carroll	NC Department of Commerce
Richard Cimerman	National Cable & Telecommunications Association
Drew Clark	Broadband Illinois
Richard Clarke	AT&T
Michael Curri	SNG Paris-Ottawa-Delaware
Mark DeFalco	Appalachian Regional Commission
Edward Feser	University of Illinois at Urbana-Champaign
Jon Gant	University of Illinois at Urbana-Champaign
Sharon Gillett	Communications Media Advisors
Tony Grubestic	Drexel University
John Horrigan	Joint Center for Political and Economic Studies
Joanne Hovis	CTC Technology & Energy
Amy Huffman	NC Broadband
Samantha Jackson	NC Broadband
Raul Katz	Columbia University School of Business
Fernando Laguarda	Time Warner Cable
William Lehr	Massachusetts Institute of Technology
Laurel Liverier	Rural Utilities Service, USDA
Blair Levin	Aspen Institute
Elizabeth Mack	Arizona State University
Michael Mandel	Progressive Policy Institute
Jim McConnaughey	National Telecommunications & Information Administration
Sascha Meinrath	New America Foundation
Karen Mossberger	University of Illinois at Chicago
Anne Neville	State Broadband Initiative, NTIA
Jane Patterson	Jane Patterson and Associates
Steve Rhody	ASR Analytics
Steven Rosenberg	Federal Communications Commission
Richard Schadelbauer	National Telecommunications Cooperative Association
Craig Settles	Gigabit Nation
Peter Stenberg	USDA
Sandeep Taxali	BTOP, NTIA
Shannon Tufts	UNC Center for Public Technology
Galen Updike	Rural Telecon Congress
Scott Wallsten	Tech Policy Institute
Deborah Watts	NC Broadband
Len Waverman	University of Calgary, Alberta
Ken Wilson	East Carolina University
John Windhausen	Telepoly

APPENDIX 2. ROUNDTABLE AGENDA

Research Roundtable on the Economic and Community Impact of Broadband
George Washington University, 7 December 2012
Convened by NC Broadband, North Carolina Department of Commerce

GOALS

- To discuss the status of research and data collection related to the economic and social impact of broadband;
- To identify specific gaps and inefficiencies in broadband research and opportunities to improve our understanding, with particular emphasis on how states can contribute to this work;
- To develop recommendations for identifying and applying best practice metrics and data resources for assessing the impact of local, state and national broadband deployment and use/adoption efforts.

AGENDA	
8:00 - 8:30 am	Registration and Continental Breakfast
8:30 - 8:45 am	Welcome Dale Carroll, Deputy Secretary, NC Department of Commerce
8:45 - 9:00 am	Goals for the Day Jane Smith Patterson, Jane Patterson and Associates
9:00 - 10:30 am	Session I: Status of Broadband Economic Impact Research Moderator- Dr. Bill Lehr
10:30 - 10:45 am	Break
10:45 - 12:15 pm	Session II: Understanding Community and Social Impacts Moderator- Dr. John Horrigan
12:15 - 1:00 pm	Lunch
1:00 - 2:30 pm	Session III: Measurement and Data Challenges Moderator- Dr. Edward Feser
2:30 - 2:50 pm	Break
2:50 - 4:20 pm	Session IV: Evaluating Data for Policy Development Moderator- Sharon Gillett
4:20 - 5:00 pm	Discussion Review and Next Steps Moderator- Dr. Edward Feser

PROGRAM PANELISTS, SPEAKERS, AND KEY QUESTIONS

Session I: Status of Broadband Economic Impact Research

Moderator- Dr. William (Bill) Lehr, Research Professor, Massachusetts Institute of Technology

- Dr. Len Waverman, The University of Calgary, Alberta
- Dr. Raul Katz, Columbia Business School
- Dr. Scott Wallsten, Tech Policy Institute

Key Questions:

- What can we conclude about broadband economic impacts on employment and productivity based on the empirical research published thus far? For example, does the research record demonstrate that broadband contributes significantly to job or productivity growth? What may be said about the magnitude of such effects? How about their applicability in policymaking and evaluation?
- Where are the most important gaps in the empirical research? What accounts for those gaps? For example, is it a measurement problem due to a lack of appropriate measures for broadband use or output? Or, is it due to inappropriate model specification or a focus on the wrong questions?
- How will the empirical research challenge change over time and what will this mean for policy-making?
- What about the empirical research challenge at the state and local level?
- What are the best ways to address the research gaps? What are the most promising avenues for future research?

Session II: Understanding Community and Social Impacts

Moderator- Dr. John Horrigan, Vice President, Joint Center for Political and Economic Studies

- Dr. John Windhausen , Telepoly
- Dr. Jon Gant, The University of Illinois at Urbana-Champaign
- Dr. Karen Mossberger, The University of Illinois at Chicago
- Laura Breeden, BTOP- Sustainable Adoption, NTIA

Key Questions:

- How have investments made in expanding broadband access and use in communities paid off?
- Are there specific verticals (health care, economic development, energy management) where outcomes have been notably good, or notably not-so-good?
- What is the “state of data” needed to better understand broadband’s impacts on individuals or communities?
- What steps are needed to improve data collection to understand community impacts?
- Is there a “catalytic effect” to broadband investments? In other words, does the process of bringing together disparate groups to pursue and execute grants lead to cooperative benefits in communities that build capacity to solve problems?

APPENDIX 2. ROUNDTABLE AGENDA

- From looking at projects to connect communities with broadband (either individuals or institutions), are there any common “do’s” and “don’ts” that policymakers (either at the state or federal levels) should be aware of?
- Looking ahead, many initiatives to improve broadband in communities will be looking for additional funding to sustain themselves. Do we have the knowledge base to give guidance to decision-makers?
- Given the evolution of the broadband ecosystem in the past four years, how should stakeholders (in states, in the non-profit sector, in the private sector, or in Washington) think differently about initiatives to use broadband to improve communities?

Lunch Speakers

- Dr. Robert Atkinson, Information Technology and Innovation Foundation, author of Innovation Economies
- Blair Levin, Aspen Institute and Gig. U, author of The Politics of Abundance

Session III: Measurement and Data Challenges

Moderator - Dr. Edward Feser, Dean of the College of Fine and Applied Arts, University of Illinois-Urbana-Champaign

- Anne Neville, State Broadband Initiative, NTIA
- Dr. Michael Mandel, Progressive Policy Institute
- Dr. Sascha Meinrath, New America Foundation
- Sandeep Taxali, Project Director, BTOP, NTIA
- Dr. Shannon Tufts, The University of North Carolina at Chapel Hill, Center for Public Technology

Key Questions:

- Given the data available today, what are the broadband policy and research questions we are best equipped to answer? Given gaps in data, what kinds of questions are being neglected? What are the major challenges in broadband data collection and how can they be overcome?
- Among the neglected questions, which should be given highest priority for attention? What kinds of data collection should we prioritize to answer those questions? What level of financial resources will be needed to undertake that data collection?
- Who should be responsible for collecting broadband-related data? What are the appropriate roles of government at different levels (municipal, state, federal), of private sector data providers/vendors, and of broadband suppliers?
- What kinds of research are needed to inform the data collection process itself? Do we need more/better research and analysis on effective data collection techniques?
- To what extent are existing data driving the ways we are measuring impact? Are we neglecting important aspects of broadband impact because of our measurements? What kinds of research would help inform better measurement?

Session IV: Evaluating Data for Policy Development

Moderator- Sharon Gillett, Senior Consultant, Communications Media Advisors

- Dr. Stephen Rhody, ASR Analytics
- Dr. Steven Rosenberg, Federal Communications Commission
- Blair Levin, Aspen Institute

Key Questions:

- How should policy makers deal with data sets that are collected or only available intermittently (e.g., available for one year because funding was available, but not reliably in future years)? Should policymakers aim to use the best data available, even if the data are available only once, or should they use data that may be less informative but can be relied upon for comparisons over time?
- What are best practices for reconciling commercial licensing agreements with the need to make public the analytic basis of policy decisions?
- What sources of funding should be developed to allow third-party analyses of policy-relevant data (i.e., analyses not done by government staff)?
- All three panelists have dealt with data collection from the state and local level of information needed to inform decisions at a federal level. What lessons did you learn from that data collection effort that might inform future program developments at the community, state, or federal level?

POLICY AND RESEARCH: HOW WELL DO WE UNDERSTAND THE FUTURE IMPACT OF BROADBAND?*

Prepared by Ken Wilson and Rebecca Powers
Community Research Laboratory
East Carolina University

As a precursor to the December 2012 roundtable, a short web-survey was developed to assess experts' views of the importance of research on several areas of the Internet marketplace for effective policy development. Views of the adequacy of the research literature on the impacts of broadband on social and economic development were also assessed.

A short questionnaire was emailed to all invited participants of the research roundtable and to approximately 1,500 other technology experts, researchers and policy makers on the Telecommunications Policy Research Conference's (TPRC) mailing list. To better understand the difference in opinion between the invited participants and TPRC members, the results from each group were analyzed separately and then compared to each other. Respondents had about two weeks to complete the five minute questionnaire. By the deadline, 24 roundtable participants and an additional 114 TPRC respondents had completed the web-survey. Most (66 percent) of TPRC respondents who completed the questionnaire were academics. The rest worked for an Institute (22 percent) or the federal government (13 percent). Overall, most respondents work or conduct research in the areas of broadband policy (46 percent) or economics (30 percent). Others specialize in broadband technology (9 percent), data analysis (7 percent) or community development (7 percent).

Overall Findings

Respondents reported that policy makers need better information in all key areas of the broadband marketplace: availability, adoption, pricing, speed, and usage. Respondents also indicated that the present base of knowledge is inadequate for policy stakeholders to fully understand the links between broadband and job growth, economic competitiveness, educational outcomes, civic engagement, health care outcomes, and energy efficiency, and the responses highlight the importance of collecting additional data on broadband pricing by speed tier.

The opinions of TPRC respondents were similar to those of the roundtable invitees and respondents listing broadband policy as their primary area of expertise reported similar opinions as other types of respondents.

*The full report will be available at <http://ncbroadband.gov> after May 1, 2013.

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North Carolina Department of Commerce
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FUNDING PROVIDED BY:

The National Telecommunications and Information Administration (NTIA) | The U.S. Department of Commerce | www.ntia.doc.gov