Report of June 1, 2020 Workshop:

BRINGING BROADBAND TO A MISSOURI COMMUNITY

July 1, 2020

AUTHORS: The Workshop Facilitators listed in Appendix I co-wrote this Report.

UM SYSTEM COLLABORATORS: The Workshop was conducted "virtually" (online) as a collaboration among the UM System Broadband Leadership Team members listed in Appendix II-A, MU Extension, and the University's All Things Missouri/CARES and SourceLink programs.

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I. Executive Summary

On June 1, 2020, nearly one hundred individuals in locations throughout Missouri and across the United States gathered "online" to help develop a "Plan" to bring broadband[1] to a Missouri community -- Bollinger County. Facilitated by faculty from all four University System Campuses and MU Extension, this Broadband Workshop sought to answer four "Core Questions:"

- ***Core Question 1*: How can we engage community stakeholders in broadband access and adoption initiatives?**
- ***Core Question 2*: What broadband systems best serve the community's needs?**
- ***Core Question 3*: What legal structures and business models are best suited to finance and operate broadband in the community?**
- ***Core Question 4*: How can we promote adoption of broadband in the community?**

Those Core Questions arose from the work undertaken as part of the University of Missouri Broadband Initiative announced last October during the first System-Wide Engagement Week. The Core Questions are intended to serve as a guide to focus efforts to develop workable strategies for bringing broadband infrastructure and broadband applications to communities throughout Missouri, and to further the University's mission, as a land grant institution, to collaborate with communities and other stakeholders to improve health, education and economic opportunities for all Missouri residents.

The specific answers to these Core Questions will vary with each community, but common themes emerged during the Workshop. Thus, while the Plan contains several recommendations that are specific to Bollinger County, many apply generally to communities throughout the State. These generally applicable recommendations (and the findings that led to them), are discussed in detail in Sections II and IV of this Report, and include the following:

[1] As used throughout this Report "broadband" means fixed (as opposed to mobile or cellular-based service), high-speed internet service. While the speed necessary to serve individual, business and government needs will vary, this Report assumes that at a service at minimum download/upload speeds of at least 25/3 megabits per second would be provided to all Bollinger County businesses and residents.

Regarding Community Engagement in Broadband Initiatives:

- Work with the community to collect better data on actual internet service availability and cost.
- Encourage community members to explain their circumstances and needs, and empower communities to prioritize their broadband objectives, taking needs and costs into account.
- Employ local and inclusive communications with the community on broadband development to create community support for the investment in broadband.
- Ensure that communications with the community are thoughtful, transparent and "jargon free."

Regarding Matching Broadband Systems to a Community's Needs:

- Assess the "gap" between the broadband infrastructure needed for business, government and personal broadband applications, and available infrastructure to deliver that level of service.
- Carefully take into account geographic terrain, population density, existing infrastructure and local regulations in choosing broadband infrastructure options appropriate for the community.
- While optical fiber is the superior broadband infrastructure technology in terms of speed and reliability, both today and for the longer term, consider pursuing cost-effective alternative "hybrid" systems that combine fiber with other less expensive viable technologies to bridge the "last mile" of service in some parts of the community.

Regarding Legal Structures, Business Models and Financing:

- Promote efforts to resolve legal ambiguities related to local government participation in public-private partnerships to build and deliver broadband service to communities.
- Pursue public-private partnerships with private internet service providers ("ISPs") to speed the construction and operation of broadband systems and position local government to use broadband to deliver essential government services.
- Seek ways to promote reasonable access private property to run optical fiber and to erect wireless transmission facilities to reduce this impediment to expanded broadband access.
- Encourage cooperation and partnerships among rural electric cooperatives and other local utilities to work together to offer internet service in rural areas.
- Develop better economic modelling and decision-making tools to plan and estimate the cost of various broadband infrastructure construction options, assess the level of public financial support needed, and minimize risks associated with deployment and operation of broadband systems.

Regarding Adoption of Broadband in a Community:

- To make service affordable and widely used, seek creative solutions that may involve targeted subsidies, the development of well-designed options to provide consumer choice, and data-focused efforts by the community to encourage providers to extend service to communities.
- Develop methods to establish baselines for evaluating broadband impacts related to healthcare outcomes, educational access and economic opportunities, and to quantitatively and qualitatively gauge such impacts on a short-term and long-term basis.

Bollinger County was chosen as the "Test-Bed Community" for the Workshop both because it currently lacks adequate broadband service, and because it has already taken an important step toward closing the digital divide by assembling community stakeholders to address the problem. To further this objective, the Workshop identified several specific recommendations for the County described in Section II.E of the Report, including the following:

- Expand participation in the Bollinger County Broadband Committee (the "BCBC") to include interested ISPs and government consultants.[2]
- Focus efforts on delivering fixed broadband service to all residences and businesses in the County.
- Engage with the Bollinger County community both to identify (by location) specific service needs for business, government and individual users, and to increase community appreciation of the benefits of broadband-based applications.
- Select appropriate broadband technologies for various parts of Bollinger County based on service needs and cost.
- Pursue public and private funding opportunities.
- Involve UM System resources and NGOs to provide ongoing training and support for the community.

Regarding the Missouri Broadband Resource Rail

A key component of the Broadband Initiative, has been the development the "Missouri Broadband Resource Rail" (www.mobroadband.org), a publicly available web-based resource intended to serve the twin purposes of providing relevant data to the many stakeholders seeking to bring broadband infrastructure and broadband applications to Missouri communities, and as a "resource connector" to bring UM System and external partners together to collaborate and achieve their broadband objectives.[3] The detailed description of Bollinger County contained in Section III.A of this Report, the information necessary to identify the level of service, cost and funding

[2] The BCBC is a community stakeholder committee already formed for the purpose of bringing better internet service to the community as a result of the community's participation in the MU Extension "Building Local Prosperity Program" (see https://extension2.missouri.edu/events/building-local-prosperity). We recommend that the BCBC be expanded to include internet service providers and State and Federal government resources.

[3] Subsequent references to the Missouri Broadband Resource Rail in this Report will generally be underlined, providing a hyperlink directly to the Resource Rail website.

options for the community, along with programs and resources identified to assist in implementation of the Plan for Bollinger County, can be found on the Missouri Broadband Resource Rail and can be used now by other communities throughout the State to develop their own "broadband plan" based on the four Core Questions. The existing Resource Rail can help communities develop strategies to implement many of the recommendations regarding broadband described in this Report. Moreover, when implemented, suggestions for expanding this resource described in Section II.F should make the website even more useful in making broadband access and adoption of broadband applications a reality in all communities throughout the State.

II. Overview and Summary Findings and Recommendations

A. Objectives of the Broadband Initiative and the Workshop

The Workshop was a part of the University of Missouri Broadband for all in Missouri Initiative (the "Broadband Initiative") announced in late October 2019. The primary goals of the Broadband Initiative are to:

1. Create the Missouri Broadband Resource Rail (or "Resource Rail") as a public-facing online resource that facilitates the development of broadband infrastructure and broadband-based applications to promote the health, education and economic welfare of Missourians by providing relevant information related to broadband and University-based programs, and by increasing connections and collaborations among faculty and researchers at each campus in the University of Missouri System, MU Extension faculty and staff, and relevant government agencies, nonprofit organizations and private businesses.

2. Use the Resource Rail to facilitate the formation of public-private partnerships involving UM System assets and external assets in communities across the State of Missouri for the dual purposes of promoting the development and use of broadband infrastructure and bringing new technologies that require broadband to function to those communities (including, among others, broadband applications that are an integral part of the System's efforts in other initiatives, such as NextGen Precision Health, telemedicine, eLearning, precision agriculture, and ecommerce).

Consistent with the Broadband Initiative's goals, the Facilitators and other UM System collaborators designed the Workshop to:

1. Test the thesis that the four previously identified "Core Questions" must be addressed as part of any plan to bring broadband infrastructure to a community.

2. Produce an actionable Plan to bring broadband infrastructure and use of broadband applications to Bollinger County, Missouri, using feedback obtained from the Workshop sessions.

3. Test the efficacy and usefulness of the Resource Rail to help address the Core Questions.

4. Capture the lessons learned from the Workshop and the creation of the Plan to generate a template for potential use in other communities (with tailoring to the circumstances of such communities).

B. Facilitators, Collaborators and Participants

The Workshop was conducted online by the Facilitators listed in Appendix I, in accordance with a design co-developed by the Facilitators, the UM System Broadband Leadership Team members (faculty from across the UM System campuses) listed in Appendix II-A, MU Extension,[4] and the University's CARES systems through the All Things Missouri platform[5] and SourceLink[6] programs, and supported by other University staff.[7] Almost one hundred individuals (listed in Appendix II-B) joined in the June 1 online Workshop as "Participants." The Participants included eleven residents of Bollinger County; representatives of local, state, and federal government, several regional and national NGOs; and educators, libraries, rural electric cooperatives and utilities, the telecommunications industry, and businesses who support increasing broadband access and adoption.

C. Methodology and Related Lessons Learned

The Workshop utilized several key methodologies to gather meaningful and recordable input from multiple stakeholders focused on exploration of the four Core Questions. First, twelve days prior to the Workshop the Facilitators distributed to all registrants, along with logistical information about the event and synopses of the "Breakout Sessions" specific to each of the Core Questions, the following:

1. A VIDEO about Bollinger County and its general lack of high-speed internet. This video was prepared by MU Extension and was included in the invitations to participate in the Workshop. It featured, among other things, video recordings of statements by five individuals from Bollinger County: Dan Abner (IT Specialist, Crossroads Medical Center); Leo Arnzen (Presiding Commissioner, Bollinger County); Eva Dunn (Director, Bollinger County Library); Juanita Walker (Senior Administrator, Bollinger County Health Center); and Becky Wiginton (President, Bollinger County Chamber of

[4] *See* https://extension2.missouri.edu/.
[5] *See* https://allthingsmissouri.org/.
[6] *See* https://www.mosourcelink.com/.
[7] The Facilitators gratefully acknowledge the efforts Robert Mize and his team in preparing Bollinger County Video and Ayyoub Ajmi and his team who set up and helped manage the technology used during the Workshop itself.

Commerce). They collectively spoke to the need of County residents and businesses for affordable high-speed internet to improve education, health care, economic opportunities, consumer experiences, and other activities, and shared associated stories of resident experiences highlighting the urgency of that need for digital equity.

2. A detailed BROADBAND PLANNING GUIDE created through a collaboration of CARES and the UM System Broadband Leadership Team. The Broadband Planning Guide is organized around the four Core Questions and includes information about potential collaborators with communities on broadband access plans, infrastructure options, funding broadband access and associated legal issues, uses of broadband, and features the ability to pull up relevant data regarding Bollinger County and other counties across Missouri.

3. Information about the Missouri Broadband Resource Rail built by UMKC's SourceLink team in collaboration with CARES and the UM System Broadband Leadership Team.

4. A general survey to gather perspectives on various aspects of broadband access and uses.

5. Information about the June 1 Workshop format including two Breakout Sessions for each of the four Core Questions. Each Workshop registrant was asked to pre-select and participate in two Breakout Sessions (on two different Core Questions). Prior to the Workshop, the respective Facilitators of each of the Breakout Sessions sent information specific to those sessions to the registrants who signed up for them. As discussed in detail in Section IV below, for some of those Breakout Sessions the Facilitators included a pre-session survey regarding key themes for those sessions.

During the Breakout Sessions, the focus was on gathering further information from Participants to inform this Report. This was done by soliciting reactions to previously circulated information (including, in some cases, survey results), posing new questions in a few different formats, displaying (anonymous) responses to those questions, and open discussions of questions, responses, and Participant recommendations.

The results of these Breakout Session efforts collectively produced hundreds of specific responses to questions asked by the Facilitators in various formats, and recordings of several hours of open discussions that informed the observations and recommendations set forth in this Report, as explained in more detail in Section IV below.

The Workshop methodology was successful in obtaining a large volume of meaningful feedback around the four Core Questions. There was good response to the survey questions posed and an informative give and take among Workshop Participants expressing their points of view.

Based on both Participant feedback and Facilitators' reflections, the Workshop design could be improved by taking more time at the beginning of the session to review the specific circumstances of the Test-Bed Community (Bollinger County in this case) with all Participants, and by giving community stakeholders an opportunity to explain in their words, and through their personal stories, the situations and hardships they and other community members confront each day because of the lack of broadband access. While we provided such information to registrants in advance of the Workshop, taking additional time at the beginning of the June 1 live event to review and highlight key aspects of that material would have better acclimated all Participants and helped set the stage for more relevant discussions targeted to the particular community.

Further, while the Workshop demonstrated that it is possible to conduct an event like this "virtually," it also underscored the need to take additional steps to ensure that members of the Test-Bed Community are physically located at a spot where they can easily provide input and that they are familiar and comfortable with the online meeting technology. Indeed, there was consensus among the Facilitators that, when circumstances permit, a Workshop such as this—with its strong emphasis on understanding community perspectives and promoting community engagement in setting priorities and developing action plans—should be conducted in-person and in the Test-Bed Community.

D. Generally Applicable Findings and Recommendations

The input collected through pre-Workshop surveys, live surveys and discussions at the Workshop, and additional post-Workshop feedback and input, includes information, ideas and

specific suggestions supplied by several residents of the County, as well as several other Workshop Participants, and is substantial and valuable. As hoped, the information gathered and explored through the Workshop allowed us to make findings and recommendations generally applicable to communities across the State of Missouri, as well as findings and recommendations specifically applicable to Bollinger County with regard to actions plans for broadband access and adoption.

This Subsection II.D provides a high-level summary of the generally applicable findings and recommendations based on that input, and the following Subsection II.E provides a high-level summary of the Bollinger-specific recommendations. The detailed explanations of both of those sets of findings and recommendations are set forth in Section IV of this Report, and compilations of Participant responses to questions we used to develop our findings and recommendations are contained in appendices cited in Section IV.

1. Core Question #1: Engaging Community Stakeholders

Core Question #1 focused on how best to actively engage community stakeholders in broadband access and adoption initiatives. The principal findings and recommendations we draw from that Core Question #1 learning can be summarized as follows:

- ***Get Better On the Ground Data.*** Community stakeholders and collaborators on broadband initiatives need much better "on the ground" data to get a truer picture of the "as is" circumstances regarding the extent of *affordable* access to high-speed internet service, and devices to use it, than is currently reflected in existing (and questionable) datasets.
    - ***Recommendation.*** We recommend following the suggestions made by Workshop Participants to embrace and expand the surveying approaches recently employed by Missouri Department of Elementary and Secondary Education (DESE) and Department of Economic Development (DED), and explore approaches used in other communities in the U.S. that have addressed this data integrity issue.
- ***Community-Driven Setting and Prioritization of Objectives.*** It is critical to empower the community itself to set and prioritize broadband-related objectives with input from

residents and local businesses, educators, health care providers, chambers of commerce, government, and other institutions.

- ***Recommendation.*** We recommend following the lead of MU Extension's "Building Local Prosperity" initiatives in this regard. As discussed in Section III below, Bollinger County, through its formation of a Bollinger County Broadband Committee, has followed this process, and that pilot has demonstrated its value as a benefit to other communities across Missouri.

- ***Inclusive Events at Sites within the County.*** In addition to compiling good data and identifying community-developed priorities, well-informed designing of broadband access and adoption actions in any county, requires, in addition to other communications and co-working events, convening participants with diverse expertise and resources together with local stakeholders *at locations within the county*.

  - ***Recommendation***. We recommend exploring suggestions made by various Workshop participants to leverage customary conveners (such as government committees, schools, libraries, and churches) for frank discussions of matching community goals with suitable and affordable high-speed internet services and use tools, including comparative demonstrations of options (functionalities and pricing).

- ***Thoughtful and Transparent Communications.*** A significant amount of skepticism and distrust is often created through (A) communications to community members from external parties that (i) are over-stuffed with tech jargon, (ii) use media that leave out the many people who do not have affordable access to broadband service and devices, (iii) lack specifics ("just more talk, no action"), or are less than forthcoming on up front and ongoing costs, *and* (B) failure of external parties to seek and obtain from community members first-hand information about the community and its perspectives on community needs, priorities and aspirations to factor into exploration of options on what might be deployed to the benefit of the community.

  - ***Recommendation.*** We recommend emphasis on developing communications strategies in both directions between external parties and community members/groups that thoughtfully take into account the particular circumstances and concerns of the intended recipients of services, and employ well-selected and diverse modes of communication.

2. Core Question #2: Broadband Infrastructure Design

Core Question #2 focused on identifying broadband technologies that will effectively and efficiently deliver the most desired broadband applications to the community at affordable costs.

The question also evoked discussion on ways to assess the availability gap. The principal findings and recommendations we draw from that Core Question #2 learning can be summarized as follows:

- ***Assessing the Requirement-Availability Gap.*** The community must assess the gap between available and required broadband infrastructure and the amount users are willing to pay for the level of service they desire. However, in no event should the community abandon the goal of making broadband at the minimum speeds 25/3 megabits per second (download/upload) available for all residents and businesses. . Efforts also should be made to achieve 100% adoption of broadband by all businesses and homes.

    - ***Recommendation****:* The community should undertake a multi-pronged strategy involving use of data from the FCC and the Missouri Department of Economic Development - Office of Broadband Development, resident and business surveys, assistance from the Chamber of Commerce, and assessments by regional planning, healthcare and other organizations, to complete a reasonably accurate broadband requirement analysis for business and residential users in the community.[8]

- ***Relevant Factors in Choosing the Optimal Infrastructure.*** Topography, geology availability of line of sight, right of way and easement access, and population density are all relevant factors in selecting appropriate broadband infrastructure that can meet the most critical expected uses identified by residents and businesses in the community. Choice of technology would also be influenced by the applications considered important by the residents of a community. Potential uses identified included access to educational resources, healthcare, government services, improved business, telecommuting and remote working opportunities, and traditional features such as online communication, news and entertainment applications.

    - ***Recommendation.*** Along with a needs analysis survey, compile and document information about geographical location of residents and business, peculiarities of the terrain, restrictions on installing infrastructure such as towers or right of way for digging and use of electric poles.

- ***Choice of the Optimum Technology:*** Gigabit-level broadband, delivered through optical fiber, will deliver the optimal level of service and is best suited to secure the future broadband needs of Bollinger County and other similarly-situated communities, except in very remote areas that can be best served with wireless technologies. Optical fiber is also likely to be the most cost-effective solution in the long run. Based on current data, 5G wireless service does not appear to be the solution for Bollinger County because of low population density, and the resulting financial unviability. Other existing cellular systems

[8] We note that the Missouri Broadband Resource Rail contains resources in the Library and Broadband Planning Guide that can be used by Missouri communities to determine the broadband access speeds needed for various residential and business applications, broadband system design components and their estimated cost. The site also includes tools to identify terrain issues, locate existing infrastructure, education, health and government facilities and existing ISPs operating in the community.

also are not suitable for the community and similar communities because they do not deliver consistent data service for residential or business use. Deployment of fiber to all homes and businesses likely is cost-prohibitive, but should be considered for most local institutions, such as schools and hospitals initially. A hybrid system that would comprise fiber backbone along major highways and electric distribution lines with various other systems like DSL, point-to-point wireless or satellite broadband, may be the best option to deliver broadband service to all in the community initially, while preserving options to expand service in the future. There must be a balance of what works to meet short term and long term objectives.

- ***Recommendation.*** Fiber optical cable should be the backbone of the broadband system and should be taken as deep as possible into the network as cost constraints will permit. Other technologies should be considered where necessary to bridge the last part of access to the network.

3. Core Question #3: Building and Operating the System

Core Question #3 focused on how to overcome legal and financial obstacles that have made the construction and operation of Broadband economically difficult in communities similar to Bollinger County. Workshop Participants examined two alternative legal models that other jurisdictions have successfully employed: (A) government ownership of broadband infrastructure that is made available to private Internet Service Providers (ISPs) for a fee on a nondiscriminatory basis (a Government Sponsored Open Access Model) and (B) government financial assistance to a single ISP (an ISP Subsidy Model). The principal findings and recommendations we draw from that Core Question #3 learning can be summarized as follows:

- ***Resolve Legal Ambiguity Regarding Permitted Public-Private Partnerships.*** Changing technologies have created ambiguity with respect to the scope and meaning of Section 392.410.7 of the Missouri Revised Statutes (a statute originally enacted to limit political subdivisions and related entities from competing against for-profit telephone companies). This ambiguity likely discourages the use of public-private partnerships to bridge the digital divide in underserved communities.

    - ***Recommendation.*** The University of Missouri System law schools, in cooperation with industry stakeholders and the Missouri Public Service Commission, should conduct research to determine the extent to which Section 392.410.7 of the Missouri Revised Statutes imposes limitations on local government participation in public-private partnerships designed to bridge the digital divide, focused specifically on the Government Sponsored Open Access

Model and the Internet Service Provider ("ISP") Subsidy Models discussed in the Workshop. Results of this research should be made publicly available through the Missouri Broadband Resource Rail.

- ***Easement Issues.*** There was general agreement that ISPs can gain reasonable access to the public right of way to locate broadband infrastructure. However, Participants generally felt that the uncertainty as to the scope of existing easements held by utilities to operate a broadband system using their existing easements often necessitated significant research and cost to determine the need and to document easement amendments.

    - ***Recommendation.*** In conjunction with MU Extension, the University of Missouri System law schools should consider using existing or new project-based courses or clinics to have supervised student teams develop model easement amendment documentation and to assist in inventorying existing easements held by rural electric cooperatives and other public utilities, with a goal of speeding the process of expanding broadband service.

- ***Encourage Collaborative Partnerships Among Rural Cooperatives and Other Utilities.*** Participants felt that some rural electric cooperatives and other utilities are reluctant to invest in and operate broadband systems in their service areas because it would be a new and largely unknown line of business for them. Several Participants have successfully established fiber and fixed wireless broadband in rural areas with similar population density and terrain as Bollinger County. Some of these Participants expressed a willingness to consider contractual arrangements to assist in the development of broadband in unserved areas.

    - ***Recommendation.*** In cooperation with industry representatives, such as the Association of Missouri Rural Electric Cooperatives, and utilities that have established ISP businesses, we recommend that MU Extension host events designed to facilitate information sharing and encourage collaborative ventures to reduce financial and operating risks related to the construction and operation of broadband systems.

- ***Develop Useful Economic Modelling Tools.*** Participants generally agreed that bringing broadband to unserved and underserved areas likely would lead to significant economic growth, improvements to healthcare delivery, and efficiencies in the delivery of public education and government services. [9] However, interested stakeholders lack economic modelling tools to easily estimate the cost of bringing broadband to a community and the measureable benefits broadband would provide the community,

[9] We note that the Library and Broadband Planning Guide in Missouri Broadband Resource Rail can be used by Missouri communities to (i) identify opportunities to use broadband to more efficiently deliver government services, so that local government can serve as a core customer for an ISP considering expansion into the community, (ii) help identify ISPs that have already received or that have applied for financial assistance to expand broadband in the community, and (iii) identify grant and low interest loan funding options that are available to bridge the finance gap.

and thus are unable to easily quantify the level of public financial support and private investment required to bring broadband to the community.

- ***Recommendation.*** In cooperation with federal and state agencies, the University of Missouri System should lead in the development of software that can be used by MU Extension and community stakeholders to create a community-specific economic model that estimates the cost of various broadband construction and deployment options, the likely economic benefits of those systems, and the amount of public financial investment required to make each system economically feasible. The University's work would be undertaken by interdisciplinary teams (e.g., from business/entrepreneurship, engineering and law schools) assembled using the "Resource Navigator" function in the Missouri Broadband Resource Rail. The software tool should be added as a feature of the Resource Rail.

4. Core Question #4: Adoption and Measuring Outcomes

Core Question #4 focused on challenges related to adoption of broadband and measuring the outcomes of broadband use. Those challenges are ultimately entwined with infrastructure access in the sense that (A) access alone is unlikely to drive the economic development, education, and healthcare impacts that are desired and (B) providers may not expand into an area that they perceive will have insufficient adoption. Participants performed a root-cause analysis activity and discussed the pros and cons of potential solutions. The principal findings and recommendations we draw from that Core Question #4 learning can be summarized as follows:

- ***Affordability is a Key Challenge.*** In the root-cause analysis activity, the key barriers included cost, low (real and perceived) benefit to cost ratio, and lack of infrastructure access. For cost, the root-causes included lack of market competition, high cost of infrastructure, and affordability for low-income residents. There was also concern that residents have historically paid high prices for poor service, resulting in low trust of providers.

  - ***Recommendation.*** Compile relevant information and, as recommended under the Core Question #1 summary above, have transparent discussions involving residents to match community goals with suitable and affordable high-speed internet services and use tools, including comparative demonstrations of options to establish functionalities and pricing.

- ***Potential Strategy: Subsidy.*** One proposal discussed was adoption subsidies. Although this has the potential to address affordability issues until anticipated economic

development impacts are realized, there was uncertainty about the best implementation. Participants felt that it was not beneficial to give this type of subsidy to consumers (who might individually prefer a cheaper option rather than leveraging collective bargaining power) or to providers (who may already receive significant subsidies).

  - ***Recommendation.*** In conjunction with MU Extension, the University of Missouri System should assemble interdisciplinary teams to explore the possibility of allowing a community organization or jurisdiction to administer such a subsidy.

- ***Potential Strategy: Consumer Choice.*** The discussion of potential solutions and definition of success both touched on the importance of choice for meeting community needs. Choice is achieved via market competition and being able to choose between providers as well as choice between bundles within an individual provider. However, increased choice may be difficult for consumers to navigate.

  - ***Recommendation.*** Community stakeholders collaborate with UM System researchers to conduct studies on willingness-to-pay for specific features, such as speed, reliability, and flexibility to develop pricing schemes that fit community needs and potential technologies.

- ***Marketing to Providers.*** Participants identified value in conducting marketing campaigns focused on increasing provider confidence in community interest. There was high interest in adoption within the community, but it was challenging to convince providers to invest in the community.

  - ***Recommendation.*** Create collaborations among community stakeholders and other stakeholders from the sectors represented at the Workshop to (A) develop modeling tools to reduce uncertainty associated with forecasted adoption and impacts of broadband investment; and (B) collect examples of success stories for broadband investment, particularly in rural areas, to increase investor confidence.

- ***Need for Equity.*** Particularly in the context of evaluating success, Workshop Participants raised equity between more and less populated areas as an important criterion. Such evaluation should be quantitative (in terms of percentage of population with access) and qualitatively (in terms of satisfaction), and include measures to predict economic, education, and health impacts.

  - ***Recommendation.*** Begin conducting annual surveys to establish baselines for evaluating broadband impacts related to healthcare outcomes, educational access and economic opportunities. Collaborate with the UM System to include qualitative impacts that may be suitable for measuring shorter-term impacts.

E. Specific Findings and Recommendations for a Bollinger County Plan

1. Use and Expand the Bollinger County Broadband Committee

Prior to the Workshop, the County had already assembled many key stakeholders to work on the Broadband access problem through the Bollinger County Broadband Committee ("BCBC"). We recommend the BCBC continue to lead efforts to bring broadband service to Bollinger County, building on the work initiated as part of the Building Local Prosperity program offered by MU Extension. To facilitate the recommendations made in the Report, we recommend expansion of the BCBC to include representatives from existing and potential internet ISPs[10] and other governmental organizations, such as the Southeast Missouri Regional Planning and Economic Growth Commission and personnel from the National Telecommunications and Information Administration ("NTIA"). We believe these representatives can provide advice on available technologies and funding opportunities and can be valuable partners with the community.

2. Focus and Direct Efforts of the BCBC

Conversations with community stakeholders demonstrate a concern about two issues related to telecommunications infrastructure in Bollinger County: (A) the lack of adequate cell phone coverage (including mobile access to the Internet) and (B) the lack of adequate fixed high-speed internet service (i.e., broadband). While each concern is important to the community, the technology, regulatory regime, opportunities for funding assistance, and companies involved in

[10] The ISP Finder contained in the Broadband Planning Guide of the Missouri Broadband Resource Rail identified Southwestern Bell Telephone Company (DSL service) as providing residential service and Show-Me Technologies, LLC as providing business service in Bollinger County. Additionally, at least two wireless ISPs clearly have an interest in providing broadband in the County: Wisper, LLC was awarded FCC grant funding to install wireless internet service in portions of Bollinger County and Aptitude Internet LLC has a pending application with the USDA for a grant and/or low interest loan to provide broadband to sites in the County. Another potential provider is Black River Electric Cooperative, which currently provides electrical service to most of the County, and may have an interest in expanding its business operations to include fiber-based internet service– or in making its physical assets available to an ISP that wishes to provide service to the community.

providing these two types of service are substantially different. We believe attempting to pursue both objectives at once through the same group of stakeholders (the BCBC) is impractical, particularly because the only mobile technology actually capable of delivering access to the Internet at broadband speeds (5G) is (based on the findings to Core Question 2) not feasible for an area as sparsely populated as Bollinger County. For these reasons we recommend that the work of the BCBC continue to focus on providing affordable fixed (as opposed to mobile) high-speed internet service to all residences and businesses in the County, and that quality of service issues for mobile cell service be addressed separately.

3. Engaging the Bollinger County Community

In accordance with the general findings and recommendations for Core Question 1 summarized above, the BCBC, working in conjunction local institutions in the County adept at convening residents and with MU Extension and System faculty and researchers, should work to promote to the community at large the benefits of affordable broadband service for Bollinger County. These efforts should consist of (A) conducting targeted information programs demonstrating how broadband-based applications for healthcare (telehealth), education (eLearning), precision agriculture, and economic development (e-business) will help improve the lives of the County's residents, and (B) bringing several key metrics for the County described in Section III.A at least up to the level of the statewide averages. Those two efforts are an important component of the Plan for at least three reasons:

(i) First by identifying new useful applications for broadband for healthcare, education, government and business, these presentations may help build demand for broadband service – which is critical to providing sufficient subscriber revenues, even if we assume that funding of infrastructure construction costs will rely in part on grants and tax incentives.

(ii) Second, by engaging UM System faculty and researchers, the County can greatly increase the opportunities to identify potential funded research and technology

demonstration projects that can serve the dual purpose of providing new operating revenues to help ISPs fund broadband expansion in the community, while at the same time introducing cutting-edge broadband-based technologies.

(iii) Third, different broadband applications have different levels of broadband service requirements (e.g., minimum upload and download speeds). As the community better understands these requirements and the capabilities of various applications, it will be able to determine the most appropriate broadband technologies to deliver service to various parts of the County.

4. Select Appropriate Broadband Technologies for Bollinger County

Taking into account the desires of the community, and focusing on data related to the cost of installation, the expanded BCBC should work to arrive at a consensus recommendation for the most appropriate broadband technology (e.g., fiber in ground, fiber on poles, fixed wireless, etc.) for different regions of Bollinger County. As discussed in the general findings and recommendations for Core Question 2 summarized above, this assessment must take into account and balance: (A) the existing infrastructure, such as the location of fiber backbone and the few locations in the County that have reliable broadband service – such as the County library; (B) the technical requirements for broadband infrastructure to operate the most critical/desired broadband applications; (C) whether the desired system can be funded and operated profitably (even with government subsidies); and (D) the adaptability of the system (e.g., the cost and ease of improving it as higher broadband speed and capacity becomes necessary to serve the County's needs).

5. Pursue Public and Private Funding Opportunities

Bollinger County clearly has some very real barriers that are holding back broadband infrastructure installation and expansion. These include: low population density; the high cost of installing fiber cable systems – particularly underground; heavily wooded terrain with deep valleys that severely restrict wireless broadband signal penetration; a population with lower than average incomes; and a low business tax base. Based on these facts, as well as the input received at the

Workshop, it is apparent that the County acting alone lacks the financial resources to pursue a public access broadband system, and that no business model exists that would permit an ISP to construct and profitably operate broadband relying solely on subscriber revenues. In other words, just as in the case of the electrification of rural America 100 years ago, the County will need significant public support, likely in the form of grants from Federal and State agencies and NGOs, along with the commitment of the community, to work creatively and entrepreneurially to close the digital divide.

While acknowledging the necessity of outside financial support, Bollinger County likely can achieve its broadband access and adoption goals more quickly by seeking out and pursuing opportunities to participate with interested ISPs in public-private partnerships to obtain funding in the form of grants, loans and tax incentives. Critical to this process is increasing awareness that *community support need not involve voted debt*. Alternative approaches can include:

(i) Supporting the streamlining and fast-tracking development of right of way, and assisting in promoting right of way access.

(ii) Through legal mechanisms such as an indefeasible right to use agreements (as described in the findings and recommendations for Core Question 3 discussed in more detail in Section IV.C), local government entities redirecting any savings realized from the use of broadband applications in government operations to assist in funding a share of the ISP's cost of expanding broadband service.

(iii) Working with private partners to pursue grants to fund broadband infrastructure development and work with ISPs that have received grants to build out their system in a timely fashion.

(iv) Working with private partners – particularly business and health care providers – to join with ISPs to assist in funding broadband infrastructure.

(v) With the support of MU Extension and the expanded BCBC, exploring tax and other economic incentives (such as the New Markets Tax Credit program) to find capital resources that can be used to finance broadband infrastructure. In this regard, the Missouri Broadband Resource Rail mapping tool (part of the Broadband Planning Guide) shows that the entire County is eligible to participate in the New Market Tax Credit program. As described in the Resource Rail library, tax credits can be an

important tool in bridging the financing gap and securing an ISP's broadband investment.

6. Involve UM System Assets and NGOs to Provide Training and Support

The utility of broadband for any community rests in effective use of the applications that rely on it to operate. The expansion, utility and economic viability of broadband infrastructure within Bollinger County will require ongoing efforts to realize the full potential of broadband applications. Section III.B below describes some key areas in which the County is underperforming in comparison to other locations in Missouri with respect to uses of broadband applications. Addressing that underutilization and increasing effective uses of broadband applications should result in improved outcomes for the community across major aspects of community life, including health, wellness, education, business, and economic development. The BCBC, with help from UM System researchers and other personnel, and in collaboration with external parties facilitated by the Resource Rail, can assist in developing meaningful systems to measure progress, and increase adoption of broadband applications through digital training and other programs designed to expand effective broadband adoption.

F. The Missouri Broadband Resource Rail

An important objective of the Workshop was to assess the effectiveness of the Missouri Broadband Resource Rail created through a collaborative effort involving two University System assets, the Center for Applied Research and Engagement Systems (CARES) housed on the MU campus in Columbia, and the UMKC's Innovation Center in Kansas City. These two organizations have created powerful web-based tools that are used widely both within the University of Missouri System and by organizations throughout the United States. CARES hosts "All Things Missouri" (www.allthingsmissouri.org) a powerful geocentric data-mapping tool used by decision makers and stakeholders throughout the State to assemble data and present it in a format that facilitates

better analysis of pressing challenges faced by communities. Separately, the UMKC Innovation Center created "SourceLink" (www.sourcelink.com), an internet-based resources-connector tool that uses a taxonomy-based search engine to help users find the resources (people, programs and opportunities) needed to collaborate and solve problems.

The Resource Rail employs technologies from both of these websites. It combines a "Library" and a "Broadband Planning Guide" that incorporate relevant resources that have been arranged around the four Core Questions discussed in this Report, with a "Resource Navigator" to help users of various types (for example, community stakeholders, educators, government and nonprofit organizations, and industry representatives) find each other and explore collaborations that are needed to close the digital divide in a community.

The Workshop provided a chance to test whether sufficient information was available to accomplish these purposes in Bollinger County. While the Workshop showed that the website could be very useful in terms of gathering information and identifying resources, it also revealed the following three areas for further development:

- ***Existing Assets and Infrastructure***. First, communities need better tools to map the location of existing and potential physical infrastructure to expand broadband assets in the community. This would include not only physical infrastructure, such as existing fiber optic cable, but also "site-based" assets, such as existing right of way, easements and physical structures (e.g., water towers and buildings) that could host broadband equipment and infrastructure.

    - ***Recommendation.*** Additional publicly-available data related to these assets should be added to the Broadband Planning Guide on the Missouri Broadband Resource Rail.

- ***Broadband Infrastructure & Financial Planning Tool.*** Second, in order to arrive at a practical plan to bring broadband to an area, and as emphasized in recommendations summarized above, stakeholders need a tool for planning how various broadband systems might be set up in the community, a working estimate of the cost of these different broadband infrastructure approaches, and a realistic idea of the "funding gap" for the system (the difference between that system's cost and the expected level of subscriber revenues likely to be available). With such a tool, communities could better assess what

broadband development solutions are practical and be more prepared to engage in meaningful conversations with potential ISPs. Further, this tool would help better inform the community of the size and type of financial support (government grants or other investment) that might be needed.

  - ***Recommendation.*** Dependent on the availability of financial resources within the UM System, a "Financial Planning Tool" should be completed and added to the Resource Rail.

- ***Add Resources to the Resource Navigator.*** The usefulness of the Resource Navigator depends on continuing to populate the website with relevant resources. These resources consist of broadband-related programs, courses, research and similar work of faculty and researchers within the University System, along with relevant resources provided by government and nonprofit organizations, and for-profit companies.

  - ***Recommendation.*** UM System faculty and staff, and other stakeholders in broadband access and adoption initiatives should be encouraged to add or update broadband-relevant resources, and to identify and encourage relevant "external resources" to become part of the Missouri Broadband Resource Rail.

III. Description of Bollinger County and Its Broadband Imperative

A. Bollinger County, Missouri[11]

1. Location and Geography

Bollinger County is located in Southeast Missouri. It sits immediately to the West of Cape Girardeau County, and borders Perry County to the North, Stoddard County to the South, and Wayne and Madison Counties to the Southwest and Northwest. Bollinger County is approximately 618 square miles in size. The County's terrain varies from heavily wooded Ozark hills with deep ravines in the Northern two thirds of the County, to more open plains of the Mississippi delta in the Southern third of the County.

2. Transportation and Infrastructure

The County has no direct interstate highway access, but I-55 runs through Cape Girardeau, County, and access to the interstate is approximately a half-hour drive from Marble Hill, the Bollinger County seat. Travel time from locations in the County to St. Louis is approximately two-three hours by car. Three two-lane state highways, Routes 34, 51 and 72, pass through the County. Although not regularly used, the City of Marble Hill owns a small airport with an unpaved runway.

Electrical service for most of Bollinger County is provided by Black River Electric Cooperative. Ozark Border Electric Cooperative services a small section of the southern portion of the County, and SEMO Electric Cooperative services the town of Sturdivant. SEMO Electric Cooperative provides fiber-based broadband, through its GoSEMOFiber Internet Service, in

[11] The information in this section was compiled from a combination of the Missouri Broadband Resource Rail, All Things Missouri/CSARES (www.allthingsmissouri.org), and U.S. Census bureau (www.census.gov and https://www.census.gov/quickfacts/fact/table/MO,bollingercountymissouri/DIS010218) websites.

certain portions of its service area, but at this point not within Bollinger County. Neither Ozark Border Electric Cooperative nor Black River Electric Cooperative currently offer broadband service to their subscribers.

Natural Gas service is provided in Marble Hill and the village of Glenallen (located just west of Marble Hill) by Ameren, Missouri. Service is supplied using a natural gas line that runs from Advance, Missouri in Stoddard County. There is an interstate natural gas line operated by Natural Gas Pipeline Company of America LLC that bisects Bollinger County. It is not known if either of these lines also has associated fiber optical cable that could be used to provide a fiber backbone connection to the Internet for broadband service to the County.

3. Demographics and Income

There are approximately 3,300 family households in Bollinger County. The median family income in the county is $52,835, compared with $67,612 for the State of Missouri as a whole. Nineteen percent of the population of Bollinger County is over the age of 65 (compared to the 16% statewide average). The population density of Bollinger County is 20 persons per square mile, compared to 87 for State of Missouri as a whole, and 1,967 for St. Louis County, Missouri.

In 2018, the average earnings for a worker in Bollinger County was $25,880 compared to $54,349 for the State of Missouri as a whole. Approximately 17% of the population of Bollinger County have incomes below the Federal Poverty Level, compared with Missouri's 14% statewide average.

4. Businesses

In 2017, there were 201 businesses in Bollinger County, employing 1381 individuals. In 2018, county-based employment declined by approximately 4%, while statewide employment

rose by nearly 1%. In 2012, per capita retail sales originating in Bollinger County were $5,921, compared to $15,036 statewide.

5. Education and Healthcare Institutions

There are four public School Districts in Bollinger County: Leopold R-III (located in the unincorporated community of Leopold in Southeast Bollinger County); Meadow Heights R-II (located in the unincorporated community of Patton in the north central portion of the county); Woodland R-IV (located in the City of Marble Hill); and Zalma R-V (located in the unincorporated community of Zalma in the southern portion of the County). There are no post-secondary education institutions in the County. The high school graduation rate for Bollinger County in 2018 was 93%, slightly better than that for the State as a whole (91%). However, only 14% of the Bollinger County population had obtained an associate-level degree or higher, compared to 36% for State of Missouri as a whole.

6. Healthcare Infrastructure

Bollinger County has no hospital. Within the County, health and medical services for County residents are provided primarily through the Bollinger County Health Center and the adjacent Cross Trials Medical Center, located in Marble Hill. Many, if not most, residents seek medical and dental care either in the Cape Girardeau area or in St. Louis. Seventeen percent of the population under the age of 65 are disabled, compared to 10% for the State of Missouri as a whole. Sixteen percent of Bollinger County's population lacks health insurance, compared to 10% statewide.

B. The County's Broadband Imperative

Bollinger County faces several critical challenges because of the lack of affordable and reliable broadband service. These challenges were well-stated by several County residents in the

VIDEO distributed to Workshop registrants in advance, and reinforced by other County residents during the Workshop and in additional post-Workshop feedback. Collectively, these stakeholders spoke directly to the need for affordable broadband to improve education, health care, and economic opportunities across Bollinger County.

Particularly notable are comments received from some of the Bollinger County stakeholders listed in Appendix III ("Bollinger County Participants") who logged in at the public library and attended the Workshop on June 1, as well as additional comments received in a subsequent meeting in Bollinger County with most of those Bollinger County Participants on June 17, 2020.[12]

Bollinger County Participants provided extremely useful information regarding (A) how residents are accessing the Internet currently, (B) the shortcomings of these methods, and (C) the adverse impact the lack of broadband access is having on the community. The comments also underscore some challenges to overcome in order to close the "digital divide" that exists in the community.

We learned that Bollinger County residents currently access the Internet through the following means:

- At home or at remote locations, over cell phone networks maintained by telecoms (primarily ATT and Verizon) using their smart phone or with computers connected to internet via portable "hot spots."
- At home, using residential DSL service offered by telephone companies.
- At home, through an ISP that offers satellite-based service.
- Remotely, at the County Library using computers that have DSL access.
- Remotely, accessing public Wi-Fi offered at a local McDonald's restaurant in Marble Hill.

[12] As previously noted, to participate in the June 1 Workshop the Bollinger County Participants assembled (socially distanced) in the County library, using computers that are generally available for public use. While there was sufficient bandwidth to maintain a stable internet connection, it was difficult and sometimes impossible for participants to interject comments during the sessions. For that reason, two Workshop Facilitators met in Marble Hill with eight of the Bollinger County Participants in person on June 17.

None of these means of internet access offers residents "broadband" as it is currently defined by the FCC (25/3 MPS). Furthermore, Bollinger County Participants noted that each method is inadequate for the following reasons:

(i) There is insufficient cell phone coverage in the County. There are not enough towers to cover the extremely hilly and densely wooded areas of the County. Even in areas where cell coverage is sufficient to get a signal, residents frequently deal with dropped calls due to lack of capacity or obstructions (trees) that block reception. These problems are exacerbated when residents attempt to access the Internet using their cell phone or an internet hotspot, further overloading the system. Additionally, one Bollinger County Participant stated that their family had paid $400 to buy a signal booster so that a hot spot could access a usable internet signal, only to find that it didn't work. More success was achieved from a second more robust signal booster – at a cost of $1800 – but neither device worked well enough to allow the family's college-age son to participate in college classes from their home.

(ii) DSL service is relatively slow, unreliable and expensive. Bollinger County Participants commented that while at times the DSL service is sufficient to handle basic tasks, multiple users (either in the same home or in other homes in the area) quickly overwhelm the system's capacity, resulting in dropped or delayed internet connections.

(iii) Bollinger County Participants noted that while satellite service is available and theoretically offers the possibility of broadband speeds at or in excess of 25/3 MPS, it is not a practical alternative in many situations because the service typically cannot perform at these speeds due to obstructions from trees and terrain. One Participant noted that the satellite ISP is unable to commit to provide service at any minimum level of download and upload speeds (because it is impossible to know how much physical obstructions at a particular location will degrade the signal, until the service equipment is actually installed); however, the customer typically must commit in advance to a long term service contract (one-two years) prior to installation. Even if the provider can achieve broadband download and upload speeds, the service plans contain monthly data transfer limits that result in reduced download and upload speeds if the use exceeds the agreed data caps. Additionally, satellite-based internet is expensive, costing $150 a month.

(iv) Finally, Bollinger County Participants noted that even though the last two solutions listed above (the County Library or public Wi-Fi) typically will provide residents internet service for basic tasks such as downloading and uploading homework, neither is a practical solution, because they required residents to travel up to a half hour each way just to access the Internet.

The lack of Broadband access (or *any* internet access) negatively impacts the lives of the community in several ways. First, several Bollinger County Participants explained that an

increasing number of residents have dropped their land line telephone service because of expense, and now rely on a cell phone as their sole means of communication both while travelling and at home.[13] For these individuals, the inability to receive reliable cell service in the home can be a significant health and public safety issue.

Two examples offered illustrate this point: The first involved an 80-year old disabled resident who was forced because of expense to drop his land line phone and rely solely on his cell phone to communicate, even though he couldn't get a signal at home. As a result, if he is at home and needs to call on someone for help, he must get in his car and drive to a location where he can get a clear signal. The second example involved a resident's husband who was discharged from the hospital with instructions to wear a remote heart-monitoring device. That device needed to periodically download information through the Internet so that it could be evaluated at the hospital. Unable to get a strong enough signal, the device's alarm would go off (the first time at 2:00 in the morning) requiring the patient to get in his car and drive to a location with a strong enough signal for the device to communicate with the hospital.

Second, the Bollinger County Health Department has difficulty performing its mission without high-speed internet. While the Health Center offices do have a DSL connection, workers report that it is often impossible to download and upload data required by State health officials monitoring the COVID-19 pandemic, and the use of telehealth innovations is limited by the fact that the internet connection is notoriously unreliable. One recent example puts this problem in sharp focus: in order to obtain a COVID-19 test, residents needed to complete an online video

[13] Like their urban and suburban counterparts across the state, Bollinger County residents are finding that as the market and support offered by telecoms for traditional "land lines" for phone service continues to decline, economic circumstances make it difficult for them to maintain cell service and a traditional land line. This has led them to drop the land line in favor of cell service only. This means that for many residents their cell phone is their only means of communicating – both inside and outside their homes. A reliable broadband connection would make it possible for residents to use an internet phone and have a reliable and stable means of communicating in their homes.

chat, which of course requires a stable high-speed internet connection, a resource unavailable in the homes of County residents, and one that is not *reliably* available even in the Bollinger County Health Center.

Third, the lack of broadband adversely impacts the ability of Bollinger County school children to enjoy the same education opportunities as students living in areas with broadband service. Several Bollinger County Participants noted that this was particularly evident when all schools were required to move to remote learning after school closures due to the COVID-19 pandemic, but the problem existed long before that. One Bollinger County Participant noted that at school her children enjoy much the same access to the Internet and computer-based learning opportunities as children who live in areas with adequate broadband service. They are equipped with Chromebooks and assigned work to complete online, but most cannot complete the assignments at home and must travel to a nearby relative's or a neighbor's house that has some internet access, or worse, drive to the County Library or the McDonalds to access free Wi-Fi.

Much the same situation exists for most all Bollinger County residents. The Bollinger County Participants made the point that most all of them have the latest smart phones and laptops, which they regularly use to access the Internet once they travel outside the County to an area that has broadband access. To paraphrase one Participant: *we know how to use the Internet, and we know what having broadband service could mean for our County; that is why we have been working for the past several months to find a way to get broadband service in the County.*

Fourth, the lack of broadband puts Bollinger County and its residents at a significant economic disadvantage. It limits opportunities to recruit new businesses to the community or for residents to start or expand businesses. It makes it more difficult to attract to the County new residents seeking a rural lifestyle. Such factors make it difficult for the County to grow its tax base

and make badly needed infrastructure investments. One Bollinger County Participant noted that the first question a business asks before locating to a community is: *"What internet service is available?"* While a business may be able to make special arrangements to bring high-speed internet to the business location,[14] that connection is far more expensive than is charged in an area already generally served, placing the County at a significant cost disadvantage. The lack of broadband makes it impossible for existing businesses to take advantage of e-commerce and tap markets outside the county.

The result is that over seventy percent of the residents of Bollinger County leave the county each day for work in Cape Girardeau or Perry Counties – work that often could be done remotely from home if an adequate broadband connection existed. One Bollinger County Participant observed that during the recent stay at home order she had attempted to work from home – but after being unable to make a phone call and access the Internet on her computer using her at-home connection, she was forced to give up.

A new resident to the County commented that she was shocked to find that there was no workable broadband access in her newly acquired home in the County. As a result, this spring her college-age son had to leave her home and move to an area that had broadband so that he could complete his online coursework and apply for a job.

County residents tended to shop outside the County (where they work), rather than where they live. County officials noted that this may explain why Bollinger County's sales tax revenue is much lower than other counties on a *per capita* basis. This theory was confirmed by sales tax statistics for the County during the recent COVID-19 stay at home order, when many of the

[14] The ISP Finder Tool located on the Broadband Planning Guide of the Missouri Broadband Resource Rail shows that Sho-Me Technologies LLC is currently providing gigabit-level service to at least one business located in a census tract in Bollinger County, based on reports submitted to the FCC.

County's workers were not travelling outside the county each day to work. The County's sales tax revenues actually *increased* during this period, presumably because these individuals were shopping near their homes, rather than outside the County to or on their way home from work.

Finally, the Bollinger County Participants are open to the idea of having fiber-based internet provided by their local electric cooperative or a fixed wireless system. However, they are concerned that a fiber-on-pole solution might be problematic unless there were substantial improvement in the maintenance of the right of ways. They are also skeptical of a fixed wireless system, as it would be difficult to maintain reliable service due to the wooded and hilly terrain in much of the County.

IV. Detailed Findings on the Four Core Questions

The four Core Questions explored in the Workshop are clearly interrelated. They address four interdependent components of an achievable plan to make broadband service affordably available and widely utilized in a community:

- Community consensus on the need and value of having and using high-speed internet;
- Affordable broadband delivery systems that best meet the needs of the particular community;
- A do-able business model and legal structure for financing and operating those systems; and
- Ensuring, measuring, and growing effective community use of broadband for desired outcomes.

That list by design begins and ends with focus on the community's commitment to valuing and using high-speed internet and to being actively engaged in broadband access and adoption action plans. The second and third components of this framework—determining exactly what systems to construct and what mechanisms to use to build and operate them—are challenging "how" endeavors. The first and fourth—community zeal on the value and use propositions and corresponding willingness to actively engage in broadband initiatives are the "why" that justifies the community stakeholders and collaborating stakeholders taking on together the mission of working through the "how" challenges.

The development of the various detailed questions used in the Workshop's information-gathering tools reflected the interrelationship of the four Core Questions. To varying degrees, the Facilitators of the four Core Questions explorations used such tools as:

- "Likert Scale Questions" (asking the responder to indicate whether they Strongly Disagree, Disagree, are Undecided, Agree or Strongly Agree with stated propositions);[15]

- "Feedback Questions" asking the responder to check boxes on possible responses listed; and

[15] For background on the "Likert Scale" approach, see, e.g., https://en.wikipedia.org/wiki/Likert_scale.

- "Card Sort Questions" to which the responder can type in, one at a time, as many answers as they would like to.[16]

The following detailed summaries of observations and findings based on information collected, while presented separately for each of the four Core Questions, reflect their interdependence, and, collectively inform the recommendations offered in this Report. Each subsection of this Section IV has three components: (1) statement of the Core Question it addresses and associated sub-questions; (2) description of the input gathering tools used to help answer those and related questions; and (3) summary of significant observations and findings based on the information gathered that is included in the raw data collected and reported in the corresponding appendices to this Report. The specific format of some of those components presented below differs somewhat due to the fact that the methods of conducting particular Core Questions Breakout Sessions varied because of the nature of the specific subject matters addressed.

A. Engaging the Community Findings

1. Statement of Core Question #1 and its Sub-questions

> **Engaging Community Stakeholders—How Can Broadband Improve the Lives of Residents of the Test Bed Community?** – How can we engage the community to discover the positive impact broadband-based applications can have on entrepreneurship and economic development, workforce development, community health outcomes, elementary, secondary and post-secondary education, the efficient delivery of government services and others?

2. Input Gathering Tools for Core Question #1

Prior to June 1, the Co-Facilitators of Core Question #1 sent a Pre-Session Survey to all Workshop registrants who chose Core Question #1 as one of their Breakout Sessions. The Pre-

[16] For background on the "Card Sort" approach, see, e.g., https://en.wikipedia.org/wiki/Card_sorting. In the context of this Workshop, the "Card Sort Questions" and response mechanics were designed to produce electronic equivalents of the "index cards" in a Card Sort, and the Workshop Facilitator engaged to do the "sorting."

Session Survey consisted of a combination of Likert Scale Questions, Feedback Questions, and Card Sort Questions. At each of the June 1 Breakout Sessions on Core Question #1, the Co-Facilitators (A) presented (anonymous) results of several of the Pre-Session Survey questions for discussion by session Participants; (B) asked session Participants to respond electronically to three Likert Scale Questions and six Card Sort Questions, and displayed (anonymous) results of responses to those questions for discussion by session Participants; and (C) invited session Participants to offer other comments, ideas, and recommendations on the Engaging Community Stakeholders subject.

The response rate to the Pre-Session Survey was good for such a pre-event survey. Of the just under 70 individuals who had expressed potential interest in participating in a Core Question #1 Breakout Session to whom it was sent, 31 responded (though not all responders answered all of the questions). See Appendix IV-A-1 for a detailed compilation of the questions asked and responses to the Core Question #1 Pre-Session Survey.

The response rate to the Likert Scale Questions and Card Sort Questions asked during the June 1 Workshop was also good. Of the 46 individuals who participated in those sessions, 36 submitted responses (though, again, not all responders answered all of the questions). See Appendix IV-A-2 for a detailed compilation of the questions asked and responses to the Likert Scale Questions and Card Sort Questions used in those Breakout Sessions.

The following summary of observations and findings regarding Core Question #1 is based on review of electronic responses to the specific questions asked in the Pre-Session Survey and during the two Breakout Sessions, discussion by Participants at the Breakout Sessions, and the supplemental post-Workshop input from Bollinger County Participants described in Section III above, and supports the associated recommendations offered in this Report.

3. Summary of Observations and Findings on Core Question #1

Validation of Need for and Commitment to Uses of High-Speed Internet:

The input collected in writing and in comments from the Participants in the Core Question #1 Breakout Sessions, including comments by several Bollinger County residents, clearly validates the assumption that high-speed internet service is much needed in the County, and if affordably accessible would be promptly put to use. The needs and desired uses most often cited included:

- Business (of all types), entrepreneurship and economic development
- Consumer access to goods and services
- Education at all levels
- Health care
- Information access and connectivity
- Job opportunities
- Population retention and growth
- Quality of life in an increasingly digital world
- Resilience and emergency response to crises

Challenges:

When asked for opinions on main reasons why there is not widespread access to high-speed internet across Bollinger County, the most often cited matters were:

- Cost
- Getting and presenting more accurate data on existing access to service and devices
- Lack of existing infrastructure
- Current lack of service (so, insufficient demonstrations of existing use)
- Low population makes it difficult for ISPs to see "a market"
- Skepticism about extent to which resident voices will be heard and listened to
- Tired of lots of talk and no action/wariness of more "planning"
- Need for government leadership and grants/subsidies from government
- Need to show sustainability

Stakeholders Needed to Address the Challenges:

When asked to identify the types of stakeholders needed to develop plans to get access to broadband service across the County, the most often cited groups were:

- Government

- Business
- Schools
- Residents
- Utility providers
- Medical providers
- Emergency responders
- Students
- Chambers of Commerce

Suggestions on How to Inform and Engage Community Stakeholders:

When asked for suggestions on how best to inform and engage community stakeholders in broadband access and adoption initiatives, many ideas were provided, including:

- More "on the ground" surveys of current circumstances—along the lines of recent Missouri Department of Elementary and Secondary Education (DESE) and Department of Economic (DED) surveys—and covering circumstances (and realistic "price points") regarding affordable access to:
    - Broadband
    - Computers and other devices to utilize broadband
    - Health Care
    - Housing
- Surveys of needs and aspirations of both individuals and institutions (businesses, government, non-governmental services organizations)
- Formation of multi-stakeholders committees (residents, experts, government, service providers, cooperatives)
- Conduct town halls and other community meetings/events, facilitated by, among other institutions, churches, libraries, and schools
- Make sure communications about the initiative are presented clearly (not overly "techie") and are transparent
- Have on-site (in Bollinger County) demonstrations of broadband technology and uses, and more related education
- Utilize diverse approaches to outreach (e.g., billboards, flyers, social media)
- Study and share observations about successful broadband initiatives in other communities (and work with national organizations—e.g., National Digital Inclusion Alliance—to gather information about such success stories)
- Pay attention to setting reasonable expectations, tailored to the particular circumstances of the County and local and regional planning

Reflecting on the raw responses to the various questions posed contained in Appendix IV-A, as well as the supplemental input from Bollinger County Participants summarized in Section III, led us to the four primary observations and specific associated recommendations set forth in

this Report. The more detailed findings set forth in this Section IV.A. capture suggestions from Participants as to particular approaches and tools to implement those recommendations regarding primary observations about Core Question #1: (i) Get Better On the Ground Data; (ii) seek Community-Driven Setting and Prioritization of Objectives; (iii) have Inclusive Events at Sites within the County; and (iv) ensure Thoughtful and Transparent Communications between external parties and community stakeholders.

B. Broadband Infrastructure Design Findings

1. Statement of Core Question #2 and its Sub-questions

> **Broadband Infrastructure–What Systems Best Meets the Community's Needs?** What will be the optimal technologies for the Test Bed Community based on cost, coverage, capacity and Quality of Service (QoS)? What will be the appropriate delivery systems to effectively and efficiently deliver the most desired broadband applications to the community and at what cost?

2. Input Gathering Tools for Core Question #2

Each of the two sessions of the Breakout group for Core Question #2 started with a short presentation on available broadband technologies, their main features, and their advantages and disadvantages. As intended, this provided the Participants with the right terms and material to use during the discussions. The sessions were in turn divided into two parts each. In the first part, the group brainstormed and discussed advantages and disadvantages of different broadband technology options generally. In the second part, the Participants discussed ways to overcome barriers to broadband proliferation and the factors that should govern the choice of the most suitable broadband technologies for a county like Bollinger County.

To channelize thoughts and give some direction to the discussions of the first part, the Facilitators provided the following cues:

- What are the technologies currently in use and which one seems to work best and why?
- Do you think 5G will solve the rural broadband problems?

- What do you think are the main barriers to widespread fiber deployment and how do you think they can be overcome?
- How willing are telephone and cable companies to deliver gigabit broadband to the predominantly rural counties?
- What kind of business partnership will bring the best technology to a county like Bollinger?

The discussion in this part was immediately followed by "propositions' in the form of the ten Likert scale questions listed, along with the results of each, in Appendix IV-B.

The second part of each Core Question #2 Breakout session was devoted specifically to exploring technology solutions for Bollinger and similar counties. The Participants were given the following points to think about with a view to zeroing in on the optimum technology for Bollinger County and other communities with similar attributes:

- What factors should be taken into account to choose the appropriate technology?
- What will be the right technology for Bollinger and similar Counties – fiber, xDSL, wireless, satellite or any other?
- What type of training, technology and service support would the community consider necessary?
- How does availability/affordability of end-user devices affect broadband penetration, and, therefore, planning of broadband network?
- What types of applications and services would be important for Bollinger and similar counties?

This discussion was followed by the seven Card Sort Questions listed, along with the responses to each, in Appendix IV-B.

There was good response on both the types of questions. Aggregated and anonymized responses appear in Appendix IV-B. The following summary of observations and findings regarding Core Question #2 is based on review of electronic responses to the specific questions asked during the two Breakout Sessions, discussion by Participants at the Breakout Sessions, and the supplemental post-Workshop input from Bollinger County Participants described in Section III, and supports the associated recommendations offered in this Report.

3. Summary of Observations and Findings on Core Question #2

A. Observations

- **What are the technologies currently in use in Bollinger County and other similarly-situated communities, which one seems to work best and why?**

  - *Optical Fiber:*

    - One Participant stated that his company initially installed towers to provide internet service but had since moved to optical fiber. The Participant felt that fiber was the ultimate solution to increase capacity.
    - Another observed that even if service was delivered through a fixed wireless connection, it ultimately would need to have a connection to optical fiber in order to connect to the Internet, and that an optical fiber broadband system would be the ultimate solution for Bollinger County.

  - *5G:*

    - Participants thought 5G is good solution for some communities, but that high frequencies and short signal range likely will limit its practical utility to densely populated areas.

  - *TV white spaces:*

    - One Participant suggested a technology that made use of unused broadcast television frequencies might be an option, but another observed that such technology would not give users true "25/3 broadband" speed. Nevertheless, some felt that this technology might be used in conjunction with other technologies to provide adequate access to the Internet for some uses.

  - *xDSL*

    - Some Bollinger County residents are using DSL service. However, several complained that the service was slow, particularly if users are located a significant distance from the distribution center. Others complained of capacity problems, complaining that if more than two people work at the same time one user is dropped.

  - *Cable Modem:*

    - There no longer is any cable service provider in Bollinger County.

  - *Fixed wireless and cellular services:*

- Bollinger County residents complained about the spotty wireless service. Even though a few new cellular towers have been added a substantial portion of the County has no service because of the terrain.
- Participants also noted that monthly data caps for service also make cellular service a poor alternative, even for doing tasks such a working on homework assignments.
- Participants observed that a fixed wireless broadband system would have similar issues and that more towers would be required to serve the community, particularly because of the terrain. Some observed that realistically it would be difficult to achieve true broadband service with a fixed wireless system.

- *Satellite:*

  - Internet provided through satellite connection cannot achieve a true broadband connection because of signal latency issues, a consequence of the fact that the signal must travel from a ground based user to a satellite located in orbit approximately 25,000 miles above the earth.
  - There are new low-orbiting satellite technologies, such as Starlink, under development that theoretically will be able to provide high-speed broadband.

- *Combination of Technologies:*

  - A combination of technologies often is required to create a cost effective solution for the community. Cost may dictate the use of wireless, particularly to provide the final link to the end user.
  - The community needs to select the right technology for today, but also consider the ability to expand and upgrade the system over the long term.
  - Technology is evolving; whatever is employed, things are going to improve, and the system will become obsolete. The infrastructure system need not be state-of-the-art, but should be capable of continuing to evolve. The industry is changing. The price of electronics is declining due to the market for more open source equipment.
  - In selecting appropriate broadband technology for each portion of the community, the intended use to be made of the system is a critical consideration. Different broadband applications (e.g., for individual consumers, business, medical, agriculture) will have significantly different speed and capacity requirements and will require different technologies to work properly.
  - Optical fiber provides the greatest degree of capacity and speed; it therefore should be used as much as possible given economic constraints (as confirmed by an economic feasibility study), and then could be supplemented with wireless service.

- **Do you think 5G will solve the rural broadband problems?**
    - Participants generally thought 5G was not a good alternative for Bollinger County. The responses received can be summarized as follows:
        - A Participant noted that the term "5G" covers a very broad range of technologies, some of which have more to do with marketing than technology differences.
        - True 5G has a substantially shorter signal range than 4G technologies, thus requiring more equipment to be located closer together, and in any event the wireless system must be connected to the network by fiber or copper.
        - One Participant that represented observed that 5G did not seem to have a workable business model to achieve successful deployment. Another noted that while 5G had potential the cost of installation likely would limit it to high population-density locations, making it impractical for rural areas where line of sight is a problem even today.
        - In summary, 5G deployment in Bollinger County is an issue because of the number of towers needed for effective service coverage.

- **What do you think are the main barriers to widespread fiber deployment and how they can be overcome?**
    - An experienced high-speed internet provider mentioned that cost is the barrier for fiber. The participant noted that its company had 7000 customers and that the cost to install fiber is expensive, costing $5000 per household.
    - Another Participant thought that funding and easement issues were the main obstacles.
    - Other Participants made the following observations:
        - It is difficult to deploy fiber in low-density areas. If you don't have funding then companies should deploy wireless services to those areas until funding is available or only extend that service to individuals or businesses that can afford service.
        - Upgradation of copper to fiber is necessary to have a digital economy. It is like changing cast iron water lines to PVC water lines. In this respect, Bollinger County is not different from other communities.
        - It should be part of a 21st century development plan. Counties build roads, bridges, dams water lines, and should partner with an ISP to install fiber.
        - Affordability of service is the key issue.

- **How willing are telephone and cable companies in delivering gigabit broadband to the predominantly rural counties?**
    - Participants felt that telephone and cable companies would not be willing to deliver "gigabit" service to communities like Bollinger County absent some financial subsidy. They noted that density is not there, and the installation cost

per mile was too high. Telephone companies have investors to answer to, so they do not want to invest in these areas.

- **What kind of the business partnership will bring the best technology to a county like Bollinger?**
    - One Participant noted that cooperatives had long-term financing options (15-20 years or more) that are not generally available to other ISPs through CoBank. This might offer opportunities to expand service in marginal areas.
    - Another Participant noted that the NRTC Board works with telephone cooperatives to provide some level of access to infrastructure financing.
    - Other Participants added the following thoughts about using public-private partnerships:
        - Selecting a "partner" with business acumen specific to the communication industry and financial sustainability are important factors in a successful broadband public-private partnerships.
        - There is a need to balance short-term and long-term objectives. The community should favor a provider and build a relationship that works for the community over the long-term.
        - Needs and objectives vary from community to community. In some instances the municipal ownership model works best, in others state law may make the structure impossible.
        - It is important for the parties to know what the risks are and what they are going to bring to the table.
        - The community needs to consider ways that they can "aggregate" their demand for broadband service. The greater the extent to which they can bring a certain base of customers that will use broadband service, the easier it is for the ISP to justify expanding service to the area.

- **What type of training, technology and service support would the community consider necessary?**
    - Technicians, installers, network administrators training is required.

- **How does availability/affordability of end-user devices affect broadband penetration, and therefore planning of broadband network?**
    - One Participant noted that in Marble Hill, some businesses have better Internet service because they have entered into special arrangements to access the Internet. Again, this shows that the issue is not "technology" as much as "affordability."

- **What types of applications and services would be important for Bollinger and similar counties?**
    - Participants expressed the following views:
        - Education and healthcare. Presently cannot do telehealth in the County.

- This depends on what you want to do and what you can afford.
- Agriculture would expand, home business will explode. There would be new secondary and continuing education opportunities.
- Video, rural healthcare and smart government applications become possible. Lancaster County uses optical fiber based applications to communicate with street maintenance facilities and has entered into a partnership with an ISP.
- Just being able to work from home will attract people to the community and foster population grown.
- For Bollinger County, a high percentage of the population leaves the county to work each day. Broadband would give the community the opportunity to bring new business in, such as a call centers and datacenters. The cost of living in the County is low; typical rent is $400-600 a month for a 3-bedroom home. But until we can get the infrastructure, business cannot relocate to tap lower cost of doing business.

- **What are some other barriers/challenges to address?**
  - Participants mentioned the following additional challenges to making broadband a reality:

    - Many existing utility easements are not located in the public right of way; so the utility must negotiate an amendment to the easement with private landowner.
    - FCC data is inaccurate; if one person in a census block has broadband then the block is deemed covered. This information should be more granular.
    - Steep terrain. There is a valley between two hills in the City of Marble Hill and, as a result, no cell service.
    - Affordability is an issue because of poverty level. If broadband is publicly financed my taxes go up to help pay for a neighbor's service.
    - Cell / wireless technology still needs to be addressed because older residents are giving up their landline for cell service but cannot use cell phone in their homes.

Summary of Likert Scale Survey:

Bollinger County representatives appear confident in their ability to use broadband for various applications. However, they felt that there is an affordability issue in increasing penetration. They were in agreement about having gigabit broadband and fiber to deliver it. They are convinced

that 5G will not be the solution for Bollinger. Many of them felt that stronger cybersecurity would be needed with gigabit broadband.

Summary of Card Sort Questions Responses:

The participants agreed that broadband is a great equalizer. Gigabit broadband will be future-proof and save money in the long run. It will bring new opportunities to Bollinger County. It is important to assess the gap between available and required infrastructure, use FCC data and resident/business surveys of requirements and what they are willing to pay. Several assessments have been done by regional planning, healthcare, etc. The Chamber of Commerce may be of help.

Regarding factors to be considered for choice of technology and the right technology, the Participants felt that terrain and accessibility are likely issues that may eliminate some options. They however thought fiber is the viable option and it will be good to use fiber for most of Bollinger County and then wireless to the very remote areas. Institutions like schools and hospitals can be served with fiber.

As far as applications are concerned, neither social nor entertainment is the priority. Educational resources, healthcare, business opportunities, improve people retention and property values are the key requirements. Remote working is an important application along with email, news and movies. Access to government service and health are the most important. Video and virtual reality will grow.

On training, Participants were of the view that basic usage training is not required. Technician training for new technology and availability of online videos will help. There could also be no-cost access to training on most common software and applications. The community should offer support for helping potential users learn options and benefits of adopting high-speed access. Telephone companies are not interested, as they do not have adequate demand and access

to subsidies. For achieving 100% penetration other than the availability issue, cost and affordability are important. The goal must be to achieve 100% coverage and 100% adoption.

B. Broadband Infrastructure Design Findings Summary

Based on the Workshop discussions and various questionnaires, it can be said that a county like Bollinger with difficult terrain, and low broadband penetration and affordability issues, presents a challenging planning and deployment situation. Some of the key findings are:

- **Need for Speed:** While a majority of Bollinger Country residents believe that gigabit speeds are relevant there were other participants who mentioned that there should not be fixation about 25/3 Mbps broadband. It would be difficult to achieve broadband speeds for the whole of the county while maintaining affordability. A high-speed connection that meets the user's requirements would work. For instance, Netflix can work at 5 Mbps and for someone who uses the connection mainly for this application will be happy to get that at affordable rates. Businesses may need higher data rates to begin with—e.g., 10 Mbps.
- **Applications Important for Bollinger Residents:** Some of the main uses of broadband important for Bollinger County are education (both secondary and post-secondary), healthcare, government, and public safety. Agriculture would expand, home business will explode, education, secondary and continuing, would be enhanced. Those benefits should be balanced with affordability. It is important to have video for rural healthcare. Presently the residents cannot Face Time for telemedicine. A high percentage of the population leaves county to work. Just being able to work from home will attract people to the community for population growth. Some more enterprising residents think that with broadband they will be able to bring the call centers and datacenters to the rural areas and attract new workers to the community. Typical rent is low, $400-600 a month for 3-bedroom home. But until the County can get the broadband infrastructure in place, businesses cannot relocate to take advantage of the lower cost of living and cost of doing business.
- **Planning Issues:** Some of the issues making the deployment of broadband to the entire county difficult are the topography and geology of the county. This makes it necessary to think of different types of broadband access. Funding, right of way, easements and the maintenance of the right of way need to be considered. This of course depends of whether the fiber is buried or above ground; terrain and geology will be the driving factor. Differences between cellular wireless systems and broadband systems should be considered in this planning process. While cellular wireless systems have the capability of offering Internet access, it can be limited and not consistent. As discovered in follow up discussions, cellular wireless availability in Bollinger County is actually a separate issue that needs to be addressed. It should be noted that due to the terrain of the County, TV whitespace would currently not be a viable option. New satellite technologies could potentially provide broadband internet in the future. While this new satellite technology

may improve broadband availability, it is unknown whether the service will be affordable when compared to alternatives. A workable plan should involve a combination of technologies by working out what is most cost effective. All technologies require fiber backhaul, so a hybrid network may turn out to be the best. Cost per mile is important and a feasibility study may be needed.

- **Ideal infrastructure:** Most Participants believed that fiber needs to be part of a broadband infrastructure in Bollinger County. Some observed that if one were to look at delivering fiber to every household in the county it would require over $23 million dollars of infrastructure investment. While this might not be achievable, a hybrid type system has potential. A hybrid system would comprise fiber backbone along major highways and electric distribution lines with various other systems like DSL, point-to-point wireless or satellite broadband. Point-to-point wireless will have its limitations because of terrain and vegetation, as it needs a clear line of sight to operate. It was very evident during the discussion that current 5G systems would not be an option for Bollinger County. There must be a balance of what works in the short term and the long term. Technology is evolving and things will improve with time. Look at several layers of infrastructure. The focus needs to be on the desired uses for broadband in order to select the most appropriate technology.
- **Business Partnerships:** One Participant mentioned that the NRTC board may work with telephone co-ops to provide some level of access to broadband infrastructure. There could also be partnerships with current internet providers to develop a more robust backbone in unserved areas such as Bollinger County. Further, one Participant mentioned that cooperatives may be able to qualify for special long term financing with terms 15-20 years or more years or more through CoBank. Successful public-private partnerships need business acumen specific to the communication industry in order to select the best technology. Sustainability is important, and both sides should discuss during negotiations the positives and negatives that they bring. Stakeholders need to select a provider and build a relationship that works for the community. This varies from community to community. In some instances, the municipal ownership model works best, but this depends on what the state law will allow.

The foregoing detailed findings set forth in this Section IV.B led us to the recommendations regarding the Core Question #2 subject matters set forth in Section I and Section II.D.2 above.

C. Building and Operating Findings

1. Statement of Core Question #3 and its Sub-questions

Building and Operating the Broadband System—What Legal Structure and Business Model Will Work? How do we design a legal structure and economic business models for financing and operating a sustainable broadband system for the community, based on anticipated cost?

2. Input Gathering Tools for Core Question #3

The Core Question #3 Breakout Sessions were organized around two alternative approaches employed to bring broadband to communities lacking it: (1) a Government Sponsored Open Access System Model (GSOA Model) and (2) an ISP Subsidized Model (ISPS Model). Prior to the Workshop, we provided Participants with materials to evaluate real-world examples of each approach along with a hypothetical structure of an ISP Subsidized Model that might include public contributions from one or more local government entities in Bollinger County. These materials can be summarized as follows:

Government Sponsored Open Access Model (GSOA Model):

The Utah Telecommunications Open Infrastructure Agency (UTOPIA) was used as an example of a GSOA. UTOPIA is a cooperative agency composed of eleven municipalities in Utah located primarily along the I-15 corridor. UTOPIA owns and operates a complete fiber optic cable system (backbone, mid mile and last mile) that makes service available to any ISP meeting its established operating criteria. Each ISP pays a flat rate per month for access to UTOPIA's system and provides internet service and, in some cases, entertainment content, for a separate fee to the end user customer. As designed, the system encourages price and content competition among separate ISP providers, while avoiding duplication of fiber infrastructure.

Subsidized ISP Model (ISPS Model):

Red Cliff, Colorado choose a different route to finance and obtain broadband service. Located in Eagle County, Colorado, the 250 residents of this town chose to obtain broadband service by partnering with a single for profit-wireless ISP – FORETHOUGHT.net. Prior to the Workshop, Participants were provided with an article that detailed how the ISP and the town worked with a local ski resort, the U.S. Forest Service, and a State agency to obtain right of way

and easement access for equipment, to finance and construct three wireless broadband transmission towers (located at the ski resort, on U.S. Forest Service land and in the town), and last mile service to the town's residents and businesses. Key aspects of the plan included: (1) obtaining public support of the plan from the town's voters in a special election, (2) utilizing State funds to bridge financing gaps and (3) thinking about ways to reduce the town's operating costs (e.g., eliminating streetlights) in order to free up funds to pay for part of the system.

Participants also were invited to consider how using a Joint Board composed of various local political subdivisions within Bollinger County that might join together to partner with a private ISP. This Joint Board would enter into a long-term contract with a selected private ISP to purchase an Indefeasible Right to Use (IRU) capacity on a broadband system that would be constructed by a private ISP. The individual political subdivisions that were members in the Joint Board would use the broadband system solely to assist in the delivery of governmental services, which might include remote learning, telehealth to residents, making government services available online, smart infrastructure, public safety, and others. Amounts received by the ISP from the Joint Board would help bridge the financing gap needed to fund construction of the system.

Finally, Participants were provided a 2018 study from Purdue University[17] that sought to measure the expected economic benefit of Broadband – relative to cost of construction and operation over a 20-year period. That study showed a benefit to cost ratio of nearly 4-1 in a rural Indiana community served by an electric cooperative.

A series of Likert Scale and Card Sort questions were used to develop comments and spur discussion related to the legality and economic viability of the various ownership and financing structures, and the challenges to building and operating a broadband system in Bollinger County

[17] See https://www.pcrd.purdue.edu/files/media/006-RPINsights-Indiana-Broadband-Study.pdf

and similar communities. This was followed by questions designed to determine the utility of the FCC and USDA grant and loan programs that are often used to bridge financing gaps related to the cost of building and operating broadband in underserved communities. Appendix IV-C to this Report contains a compilation of that detailed collected input. The following summary of observations and findings regarding Core Question #3 is based on review of electronic responses to the specific questions asked during the two Breakout Sessions, discussion by participants at the Breakout Sessions, and the supplemental post-Workshop input from Bollinger County Participants described in Section III, and supports the associated recommendations offered in this Report.

3. Summary of Observations and Findings on Core Question #3

The feedback gained from discussions during the live Breakout Sessions on Core Question #3 appeared to coalesce around three key points: legal issues regarding public-private partnerships; legal easement issues; and high capital and operating costs.

Legal Issues – Public-Private Partnerships:

First, it became clear during the June 1 discussions, and reinforced upon analysis of the written survey feedback, that there is the need to clarify Missouri's rule governing local government participation in broadband projects. Currently, section 392.410.7 of the Missouri Revised Statutes[18] could be interpreted in a way that may or may not allow local governments or

[18] The text of the Statute follows:

"7. No political subdivision of this state shall provide or offer for sale, either to the public or to a telecommunications provider, a telecommunications service or telecommunications facility used to provide a telecommunications service for which a certificate of service authority is required pursuant to this section. Nothing in this subsection shall be construed to restrict a political subdivision from allowing the nondiscriminatory use of its rights-of-way including its poles, conduits, ducts and similar support structures by telecommunications providers or from providing to telecommunications providers, within the geographic area in which it lawfully operates as a municipal utility, telecommunications services or telecommunications facilities on a nondiscriminatory, competitively neutral basis, and at a price which covers cost, including imputed costs that the political subdivision would incur if it were a for-profit business. Nothing in this subsection shall restrict a political subdivision from providing telecommunications services or facilities:

(1) For its own use;
(2) For 911, E-911 or other emergency services;
(3) For medical or educational purposes;

related entities to own a broadband system, even if that system is used for applications such as education or emergency response.

Legal Issues Easements:

A majority of Participants generally did not feel that lack of access to *public* right of way on which to locate broadband infrastructure was a significant impediment to the development of broadband. However, discussion in each of Breakout Session clarified that Participants were focused only on the ability to gain access to *government owned* right of way. Discussion then turned to the much more significant problem faced by utilities and rural electric cooperatives that wish to use existing easements that currently provide electrical service to deliver broadband service. Here Participants noted that identifying existing easement documents, evaluating the scope of permitted use under the easement, and in many cases amending the language to permit broadband service could be extremely time-consuming, and in some cases quite expensive.

High Capital and Operating Costs:

There was near-universal agreement among Participants on the need for and value of broadband access for rural and small-town Missouri. Nonetheless, the high capital and operating costs stand as a significant barrier to increasing access to high-speed internet in these regions. The unfortunate reality is that the cost of building and operating a broadband system in areas similar to Bollinger County (with similar population density) is less than half the expected revenues one could expect to receive from operating the system over a 20-year period according to studies conducted at Purdue University. This is particularly relevant for areas like Bollinger County, where the population density is less than ¼ of the average for the State of Missouri as a whole, and

(4) To students by an educational institution; or
(5) Internet-type services."

only *1% of the density for St. Louis County*, where fiber to the home (FTTH) service is more common.

Participants thought this fact largely, *but not entirely*, explained why Bollinger County lacked broadband service today. In these situations, it simply is not economically feasible for a for-profit ISP to provide service to the community if it has to rely solely on subscriber revenues to fund construction and operation. Financial assistance will be necessary to bridge this financing gap between operating revenues and the cost of building and operating the system in Bollinger County, but it was observed that other similarly situated areas had been able to overcome that obstacle, find the necessary financial assistance and finance and operate a broadband system.

Operational Support for Interested Rural Electric Cooperatives and Utilities:

Despite significant economic challenges, several Participants representing rural electric cooperatives and local telephone companies noted that they were able to offer broadband to their customers, even though located in areas with population density and terrain issues similar to those in Bollinger County.[19] These entities relied on financial assistance from government grants provided by the FCC, USDA and most recently the State of Missouri to close the financing gap, build broadband infrastructure, and have been able to successfully operate their systems in rural, sparsely-populated communities.

During the course of the Core Question #3 Breakout Sessions, it became clear the lessons these entities had learned in building and operating their systems might provide an opportunity for

[19] For example, the town of Red Cliff, Colorado featured in the Workshop as an example is located in a county with only a slightly higher population density than Bollinger County (31 per square mile) yet it was able to obtain broadband service. Closer to home, Moniteau County, Missouri has a population density of 37 individuals per square mile, yet it has gigabit fiber service from CO-MO Connect, a subsidiary of Co-Mo Electric Cooperative. Residents of Scott County, Missouri, with a population density equal to the state average (93 per square mile) have gigabit fiber service available through GoSEMOFiber. Even more surprising, residents of Chariton County, with a population density half that of Bollinger County (ten people per square mile) have 500 mps fiber broadband service available through the Chariton Telephone Company.

collaboration between these experienced providers and rural electric cooperatives that thus far have been unwilling to enter this line of business. The challenges in building and operating a broadband network are quite different than those required to operate a reliable electrical power grid. Yet several Participants that have already successfully overcome those obstacles expressed a willingness to discuss collaborative arrangements where they would partner to make their experience and expertise in the operation of a broadband network available to cooperatives that were considering this line of business.

The Need to Make an Economic Case for Broadband Investment:

Turning to the feedback given in the written survey responses, we identified several recurring themes.

The responses to one survey question ("*What would a governmental entity need to do to convince investors to finance the cost of Broadband Infrastructure*?") offered different variations on a similar response: a governmental entity (such as the county government) would need to demonstrate a clear, compelling business case with a high likelihood of cost recovery and a reasonable profit to have a chance at attracting a private investor to the community.

Responses to the third survey question posed to participants ("*What would a local government need to do to convince voters that it should assist an ISP's capital investment by buying long term rights to capacity on the ISPs system?*") underscored one of our findings from the live Workshop discussion; namely, that widespread and equitable economic development (and other) benefits would need to be demonstrated to the community for them to be willing to provide some level of local government economic support to a broadband network buildout.

Finally, responses to the Likert Scale question concerning the Purdue University economic model study revealed a significant level of uncertainty as to the correctness of the conclusions reached, with nearly 2/3's of the responses uncertain as to the results.

D. Community Adoption Findings

1. Statement of Core Question #4 and its Sub-questions

> **Community Adoption —How Do We Inform and Promote Applications of Broadband?** What types of content and delivery systems will best educate the community so that these new broadband applications are used effectively and efficiently to improve and promote entrepreneurship, workforce and economic development, community health and education outcomes, etc.? How do you evaluate and improve upon those outcomes?

2. Input Gathering Tools for Core Question #4

The two Core Question #4 Breakout Sessions had (combined) over 30 Participants providing input and responses to our discussion questions. Before the Workshop, Participants received materials that described the problem, agenda, and potential strategies. That material is provided in the Appendix IV-D.

Participants in the Core Question #4 Breakout Sessions performed a root-cause analysis activity and discussed the pros and cons of potential solutions. They were asked a series of questions to gain their input and increase everyone's understanding of the challenges the residents face, but also as a means of increasing everyone's understanding of how the overall utilization of the Internet, once it is available, can be increased to best meet the needs of the county and to ensure the economic viability of such an enterprise.

Card Sort Questions activities were used to address the following questions:

- What is broadband access?
- How would Bollinger County look different with broadband access in both positive and negative ways?

- What's the largest barrier to broadband adoption, assuming that infrastructure is available? (As a follow up, we asked Participants "why?" five times to determine the root cause)?
- How can we increase broadband adoption rates? The latter involved asking Participants to discuss the pros and cons of the following options:

    a. *Subsidize Adoption:* In 2017, the rural poverty rate was 16.4%, compared to 12.9% in urban areas.[20] As a result, rural consumers may spend more of a percentage of their income on Internet access for lower quality service, when compared to their urban counterparts. Most "un-adopters" cite cost, other options for accessing the Internet, and inadequate computers as their reasons for cancelling service.[21] Rather than just subsidizing infrastructure to promote access, it may be valuable to also subsidize adoption. This may help the system reach a tipping point where economic development impacts can be achieved. However, there are many options for implementing this type of solution. For example, who should receive the subsidy? The provider? The user? A third-party?

    b. *Digital Literacy Campaign:* Digital literacy campaigns may benefit from incorporating social aspects, such as connecting experienced internet users with potential users within a community, and might be a successful strategy for increasing adoption rates.[22] For example, a broadband initiative in Haiti empowers aspiring online entrepreneurs through a training program and shared computing infrastructure. [23] What is important for making digital literacy campaigns successful? Who should deliver or manage the campaign?

    c. *Prioritize Applications:* Different populations and industries use the Internet for different reasons at different times of day and accrue different benefits. School-age children need access in the late afternoon when they get home from school to do their homework. Local businesses need access during their operating hours to run credit card machines and handle online ordering to expand their business. Industrial customers may need 24/7 access to run equipment or high-speed access for a limited duration to download large CAD files or firmware updates. Hospitals may be able to schedule surgeries around internet access in order to expand their tele-medicine capabilities. Communities may value some of these applications more or less than others. As a result, it may be valuable to focus adoption efforts and/or technological solutions on specific applications rather than on access and adoption more broadly. What applications are most important?

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[20] United States Department of Agriculture (USDA), Economic Research Service. (2018). Rural America At A Glance: 2018 Edition. Retrieved from https://www.ers.usda.gov/webdocs/publications/90556/eib-200.pdf.

[21] Whitacre, B., & Rhinesmith, C. (2016). Broadband un-adopters. *Telecommunications Policy*, *40*, 1–13. https://doi.org/10.1016/j.telpol.2015.11.008.

[22] LaRose, R., Strover, S., Gregg, J. L., & Straubhaar, J. (2011). The impact of rural broadband development: Lessons from a natural field experiment. *Government Information Quarterly*, *28*, 91–100.

[23] Blantz, E., & Summer, M. (2011). The Rural Broadband Initiative Toward a new model for broadband access in Haiti and beyond. *Telecom World (ITU WT),* 129–134. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6100943.

- How can we describe success for broadband adoption?

Appendix IV-D to this Report contains a compilation of input provided by Participants in response to the questions posed to them. The following summary of observations and findings regarding Core Question #4 is based on review of electronic responses to the specific questions asked during the two Breakout Sessions, discussion by Participants at the Breakout Sessions, and the supplemental post-Workshop input from Bollinger County Participants described in Section III, and supports the associated recommendations offered in this Report.

3. Summary of Observations and Findings on Core Question #4

What is broadband access?

The Participants' responses varied, but overwhelmingly the concern was the need for high-speed access to the Internet to allow for business transactions including on-line business startups, education support, shopping and streaming video 24/7. Key attributes of broadband access include speed, reliability, and affordability. In addition, broadband access was described as the ability to engage with specific applications, which may vary in terms of speed and reliability requirements.

How would Bollinger County look different with broadband access in both positive and negative ways?

The overall response to this question was overwhelmingly positive about the impact of broadband access and focused on the improved quality of life in terms of improved education access, business activity, healthcare access, access to government services, population retention and expansion, employment opportunities, and access to new ideas (described as "a larger world"). Negative impacts focused on privacy concerns (i.e. "big brother is watching") and loss of connection between local people.

What is the largest barrier to broadband adoption, assuming the infrastructure is available?

The third question was multi-leveled, asking Participants "why?" in response to each response. In this way, Participants were encouraged to explore and discern the root cause of the potential of low participation of the county if broadband was available to the residents and businesses. This information is important before technology is deployed so educational programs and training could be provided to increase overall adoption and utilization. Once the question was asked, we used the 5 whys method[24] to help Participants think deeper about the question. The primary starting points included (1) Cost (most common response); (2) Low (Real and Perceived) Benefit to Cost Ratio; and (3) Lack of Infrastructure.

The root causes varied across these barriers:

- Cost
    - Lack of Market Competition
        - Because sometimes only one provider exists and their rates are too high
        - Insufficient options for packages to find right fit
    - Technology and Installation Cost
        - Satellite is too costly
        - Low population density makes it difficult to spread out cost
        - Remoteness
    - Affordability
        - Socioeconomic status of population and low wages being paid
- Low (Real and Perceived) Benefit to Cost Ratio
    - People don't think they need it because they've gotten by without for so long
    - Cost benefit ratio is low because it is expensive but doesn't work well
    - Many people, especially older, don't have knowledge or experience how to access online services
    - Habits

[24] The 5 whys method is a root cause analysis strategy developed and implemented in the Toyota Motor Corporation. See https://www.toyota-myanmar.com/about-toyota/toyota-traditions/quality/ask-why-five-times-about-every-matter.

- Lack of Infrastructure

    - Low density of available customers
    - Not knowing what needs to be done and have a timeline
    - Remoteness
    - It is full of hills and valleys

How can we increase broadband adoption rates?

The ideas to increase adoption rates centered on three primary themes:

- Reduce cost

    - Provide bundles to match cost to service quality
    - Limit cost to users (e.g. with regulatory approach)
    - Provide term-limited subsidies for early adopters

- Marketing campaign focused on increasing provider confidence in community interest

    - Build strategic partnerships with local electric utility, businesses, community organizations, faith community etc.
    - Highlight success stories and best practices for maximizing impact
    - Provide training and education to potential providers to increase confidence in adoption

- Engage community

    - Ensure community is involved in planning infrastructure build-out
    - Ensure equity in access for town vs. rural areas
    - Develop relevant content for community
    - Provide computers and other equipment to access the Internet for low or no cost

These ideas roughly aligned with the three ideas proposed in the pre-Workshop materials.

However, the discussion placed additional emphasis on the importance of community engagement.

What are the pros and cons of the options described below?

Subsidize Adoption:

- Concerns about giving subsidies directly to users because providers may pull out and remove infrastructure. Previously, the cable TV provider removed infrastructure, which made it challenging to find a new provider. Individual users may prioritize the cheapest provider, which may not lead to sufficiently high-quality access. Providers are already

being subsidized. It may be helpful to give an adoption subsidy to a local authority or community organization.

Digital Literacy Campaign:

- This is an important piece, but it does not solve the whole problem. Different generations have different needs. High school students can be involved as trainers. It may be helpful to use a train-the-trainer approach that centers on core community members who best understand where the needs are.

Prioritize Applications:

- Concerns about the challenge of prioritizing access for a whole community. This does not account for the diversity of needs across the county. Top-down approaches have a lot of flaws.

How can we describe success for broadband adoption?

Success can be defined in quantitative as well as qualitative terms. There was a big emphasis on the importance of equitable access and increasing choice for consumers. Success can be measured directly (in terms of adoption rate) or indirectly through specific applications (such as economic development, education, and healthcare).

- Quantitative metrics
    - 50% adoption rate
    - 80% utilization county wide
    - Median income increases by 20%
    - Population growth (more staying or coming to the county to live)
    - Number of new homes and businesses connected, beyond current baseline
    - Local GDP increases dramatically
    - Increase in property values
- Equity
    - Everyone who wants to access broadband is connected
    - When everyone has the same ability to access the Internet to power their actions online, whatever they may be, the same as they can access electricity, we've won
    - I really don't think you can call it a success until 100% of the population has the ability to connect to high-speed. Actual adoption rates would be lower, of course.

- Application-driven
    - Economic development: more business opportunities and more employment; new businesses opening in the region
    - Education: Student achievement
    - Healthcare: Better and more accessible health care
- Resilience
    - Students, business and government are able to continue with their activities in a work from home environment

---

The observations and findings summarized above, and supported by the information reported above and in Appendix IV, led us to the recommendations for making broadband widely available in more Missouri communities generally set forth in Section II.D, and the specific recommendations for a Plan to bring broadband to all of Bollinger County set forth in Section II.E. On behalf of all of the many UM System collaborators involved in the planning and implementation of the Bringing Broadband to a Missouri Community Workshop, we thank all Participants who joined in the Workshop, and all other parties who supplied relevant input before, during or after the Workshop or contributing to this endeavor. We hope this Report will help us collectively pursue the objective of having "Broadband for All" in every Missouri Community.

Appendix I

Workshop Facilitators

Core Question 1

Sarah Denkler, Regional Director, Southeast Missouri Regional Office, MU Extension, https://extension2.missouri.edu/people/sarah-denkler-43787

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https://law.umkc.edu/profiles/faculty-directory/anthony-j-luppino.html

Core Question 2

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Kent Shannon, Field Specialist in Agricultural Engineering, MU Extension

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Core Question 3

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Core Question 4

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Appendix II-A

Broadband Leadership Team Members

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Appendix II-B

Workshop Participants

Aaron Deacon	Kansas City Digital Drive	Juanita Welker	Bollinger County Health Department
Abby Eccher	Unified Government of Kansas City	Katherine Foran	University of Missouri
Alison Copeland	UM System	Kathleen Quinn	University of Missouri Healthcare
Amanda Graor	Mid-America Regional Council	Kelly Mitchell	Boothill Regional Planning Commision
Amber Childers	MU Extension Mississippi County	Kent Shannon - Facilitator	MU Extension
Amy VanDeVelde	The Oasis Institute	Kim Martin	Missouri Development Finance Board
Ashley Newell	Woodland Schools, Bollinger County	Lav Gupta - Facilitator	UMSL
Ashley Rhode	UM System	Liz Roberts	Missouri Department of Agriculture
Barbara Glesner Fines	UMKC	Lynn Hodges	Ralls County Electric Cooperative
Becky Wiginton	Bollinger County Broadband Committee	Marc McCarty -- Facilitator	UMKC
Beth Lincoln	Bollinger County Community - Student	Max Summers	University of Missouri
Bill Turpin	MU Office of Economic Development	Melanie Keeney	Missouri S&T
Bonnie Prigge	Meramec Regional Planning Commission	Mike Haynes	ATT
Brookelynn Shell	Bollinger County Community - Student	Mike Stanard	Missouri Health and Educational Facilities Authority
Bryan Boots - Facilitator	UMKC -- Regnier Institute	Nan Cen	Missouri S&T
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Carrie Coogan	Kansas City Public Library	Nate Addington	UMKC
Casey Canfield - Facilitator	S&T	Paula Bridges	Bollinger County Broadband Committee
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Cory Beard	UMKC	Quentin Rund	BioSTL
Crystal Jones	Ozark Regional Planning Commission	Randy Steinman	RL Steinman & Associates
Dara Macan	SourceLink	Richard Cane	SBA Communications
Darren Farnan	United Electric Cooperative	Richard Proffer	MU Extension
David Queen	Gilmore Bell, P.C.	Rick Roth	BioSTL
David Young	City of Lincoln, NE	Rick Usher	City of Kansas City
Donald Williams	National Telecommunications & Information Administration	Rob Harrington	City of Houston, Mo
Ellen Balcer	SBC Global Services, Inc.	Rob Williams	SourceLink
Eva Dunn	Bollinger County Library	Roger Edgar	UMKC
Frank Bridges	Bollinger County Broadband Committee	Ronda Elfrink	Bollinger County Broadband Committee
Frank Liou	Missouri S&T	Ryan Krull	UMSL
Gabriel Fumero	Kansas City Hispanic Economic Development Corporation	Saljal Das	Missouri S&T
Gus Hurwitz	University of Nebraska	Sam Tennant	MU Extension
James Stegeman	Costquest	Sarah Denkler – Facilitator	MU Extension
Janie Dunning	Bollinger County Broadband Committee	Scott Woods	National Telecommunications & Information Administration
Jeremy Hegle	Kansas City Federal Reserve Board	Shams Bhada	Worchester Polytech Institute
Jeremy Tanz	Southeast Missouri Regional Planning Commission	Sherry Nelson	MU Extension
Jim Gann	University of Missouri	Shibu Jose	MU Extension
Joe Mullins	University of Central Missouri	Sonya Fulton	Bollinger County Collector
John Musau	Digloso, Inc.	Steve Walentik	UMSL
John Szymanowski	Co-Mo Connect	Sue Schaefer	Bluebird Network
Joseph Millard	Ameren	Tad Brinkerhoff	MU Extension

Thomas Vought	MU Extension
Tim Arbeiter	Missouri Department of Economic Development
Tom Esselman	Connecting for the Good
Tom Howard	Callaway County Electric Cooperative
Tony Luppino – Facilitator	UMKC
Tracy Graham	Audrain County, Missouri
Tracy Greever-Rice	University of Missouri System
Travis Allen	Total High Speed
Trey Wiginton	Bollinger County Broadband Committee
Vijay Chauhan	BioSTL
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Wendy Ottman	Missouri.com
Wendy Pearson	Kansas City Public Library
William Wells	A STEAM Village
Zach Pollock	Association of Missouri Electric Cooperatives

Appendix III

Bollinger County Broadband Committee Member Participants

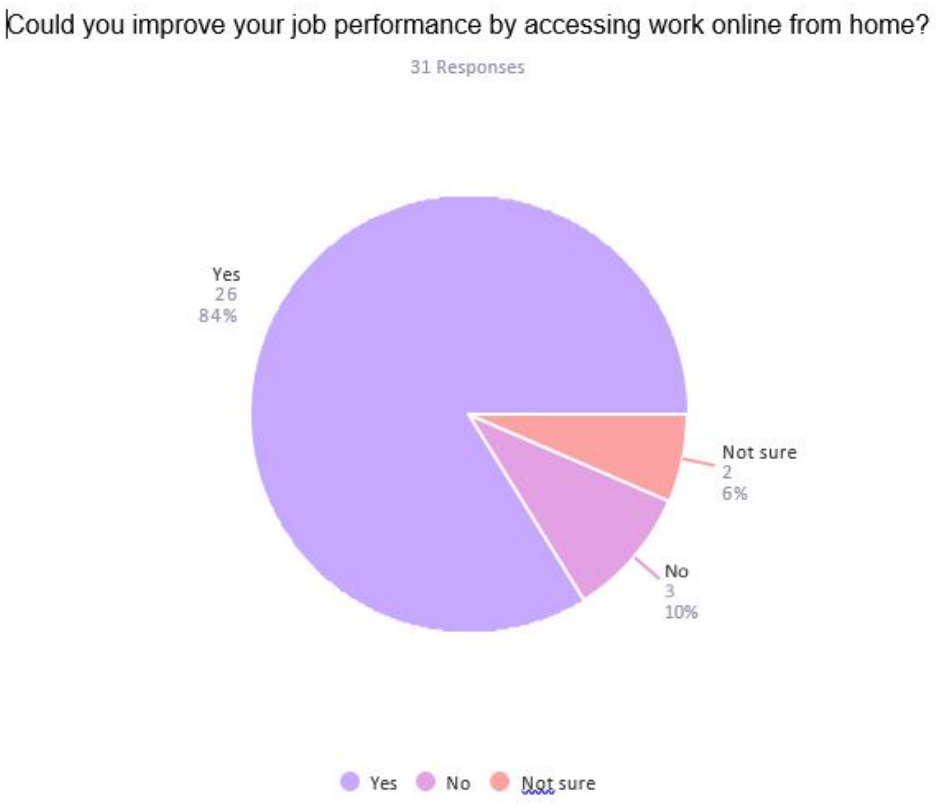
Trey Wiginton
Becky Wiginton
Eva Dunn
Ashley Newell
Juanita Welker
Ronda Elfrink
Ellen Balcer
Elizabeth Lincoln
Brooklynn Shell
Paula Bridges
Frank Bridges
Sonya Fulton

Appendix IV-A

Core Question #1 Survey Questions and Results

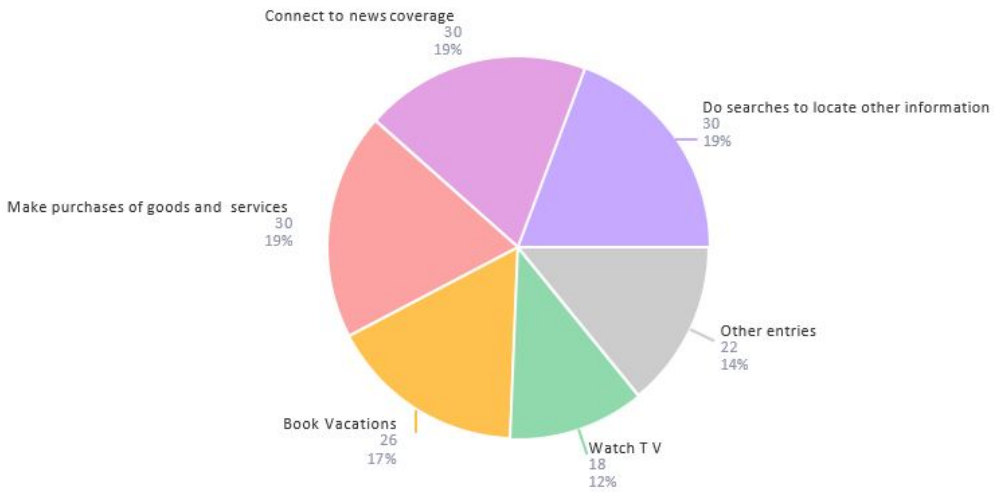
1. Responses to Pre-Workshop Core Question #1 Survey:

A. ***Responses to Likert Scale or Check Boxes Propositions/Questions:***



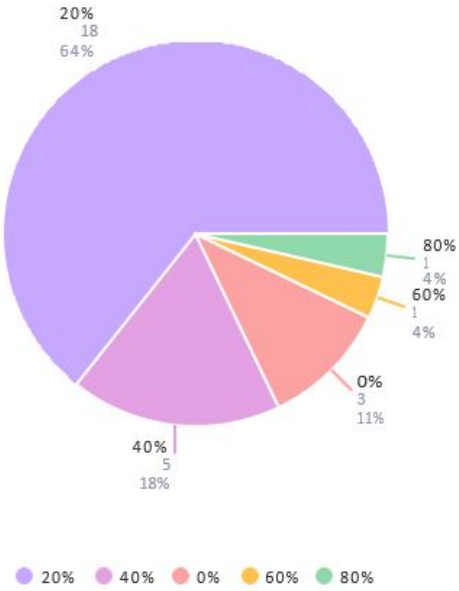
Do you personally do any of the following online? (please check each that you do online):

31 Responses



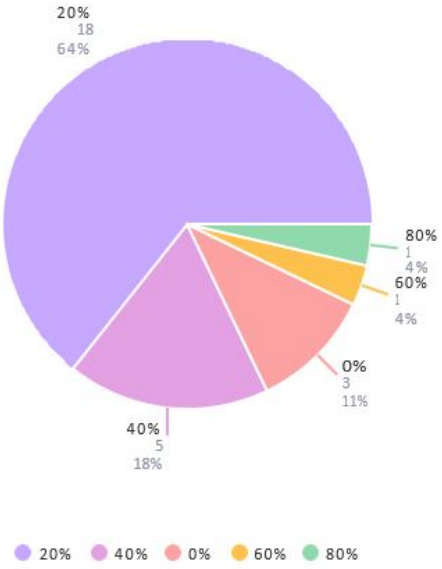
What percentage of Bollinger County do you believe currently has affordable access to adequate broadband service?

28 Responses - 3 Empty



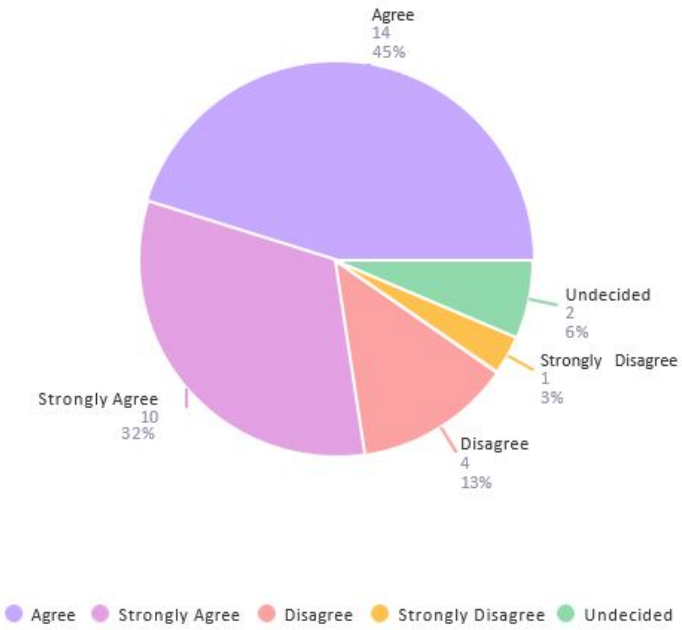
What percentage of Bollinger County do you believe currently has affordable access to adequate broadband service?

28 Responses - 3 Empty



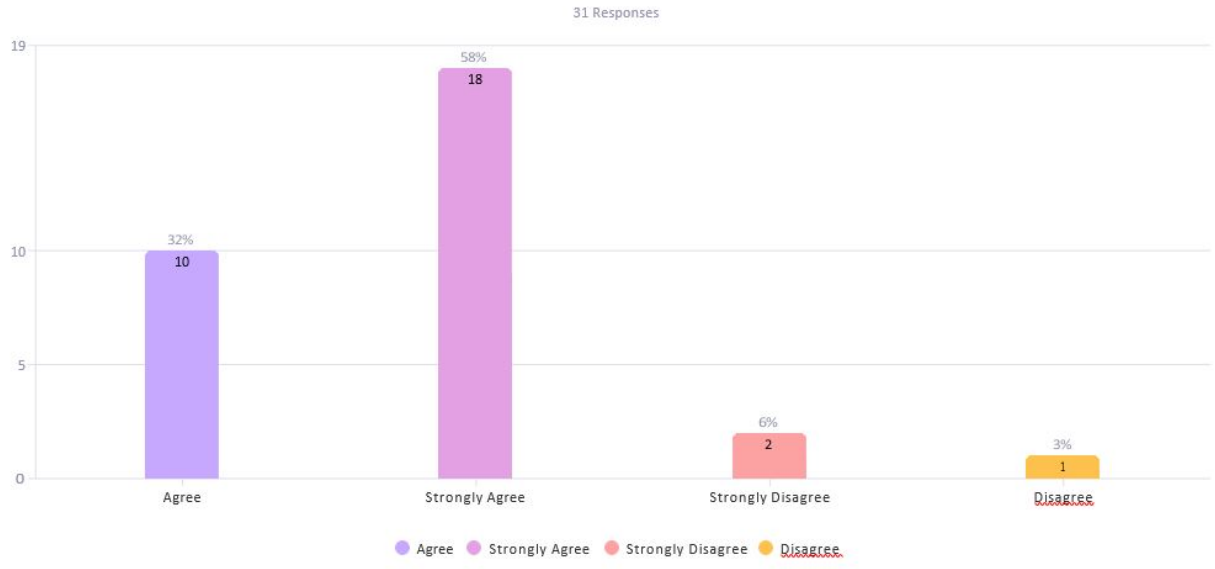
For most adults, access to high-speed internet is a significant factor when deciding where they want to live.

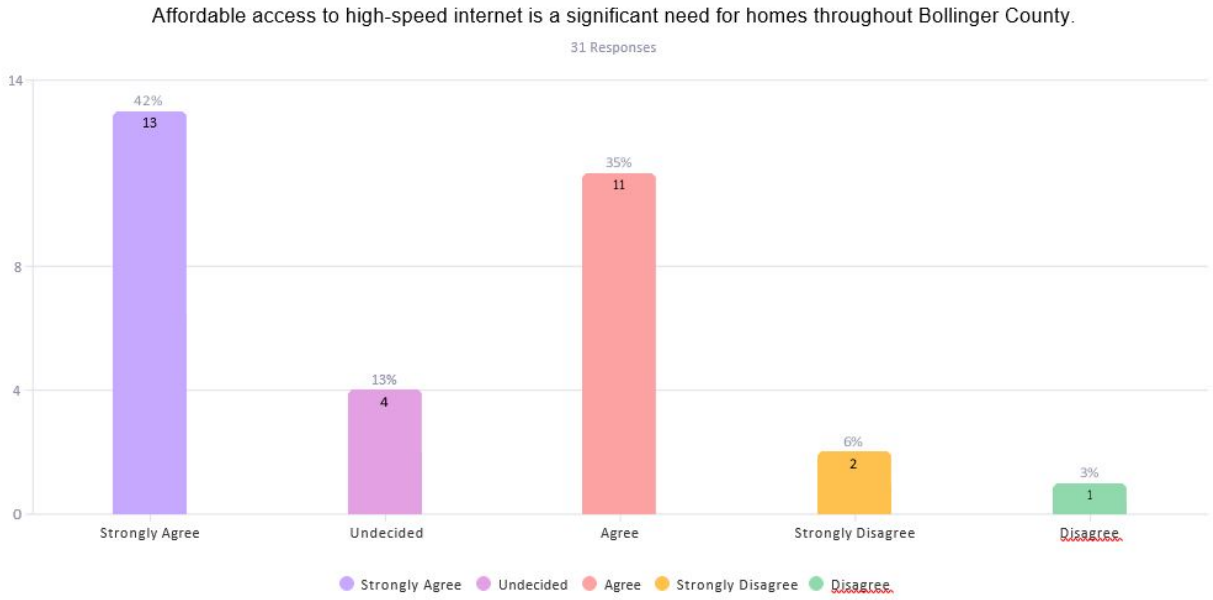
31 Responses



A high school student in a rural community is more likely to want to attend college if they could do so online and live at home.

Many communities in Missouri are at a disadvantage because of the currently low level of broadband availability.




Affordable access to high-speed internet is a significant need for homes throughout Bollinger County.
31 Responses
14
8
4
0
42%
13
13%
4
35%
11
6%
2
3%
1
Strongly Agree
Undecided
Agree
Strongly Disagree
Disagree
Strongly Agree
Undecided
Agree
Strongly Disagree
Disagree


Does a school in your community utilize the following to supplement classroom learning? (please answer "Yes" or "No" or "Don't Know" with respect to each):
31 Responses
30
16
8
0
94%
29
6%
2
0%
0
Yes
Not sure
No
Yes
Not sure
No

B. Responses to Card Sort Questions:

Q1. You received an Information Package with basic statistics about Bollinger County. What other information do you believe would be important to determine the correct type of broadband to introduce to the County?

- Not just education as a whole, but recognizing how much of our school work relies on internet access.
- Current providers serving the area and service maps that do not disclose fiber routes but would help us understand what is already available and where.
- I would like to see a map of actual housing.
- NONE
- The cost of broadband
- county five year plan submitted to the State
- Knowing the geography
- I believe it was well informed.
- I missed that email. Just found it and will review.
- The only "correct" type of broadband is fiber to the home.
- Do the schools have interest or budget in providing devices to all students if at home access was guaranteed?
- What is current landscape with respect to device ownership and age of devices?
- distance between zip code of home and work for all residents
- age demographics
- Pricing
- Why Bollinger County? I don't even know where it is.
- Did not receive
- Large employers/Local industries that may be dependent on access for retention or expansion purposes.
- Health indicators
- access to health care
- social determinants of health
- I would like to see the options and the cost
- Transportation
- Assessments

Q2. What concerns do you have about the process of developing a plan to make affordable high-speed internet service available across Bollinger County?

- Inaccurate information on the FCC website showing there is coverage where there is not.
- Realistically the amount of people who don't have that access, it makes me wonder if truly ALL of Bollinger County will be abe to get access, or if people will still have to drive to McDonalds' just to finish their project.

- cost and whether residents are willing to pay for broadband
- see previous answer
- My only concerns are will there be sufficient funding to encourage the broadband build and truly affordable options for the residents, once a plan is developed
- I do not understand much of the technical aspects and how to implement who will do what as far putting into place the actual lines, etc.
- None at this time
- Cost
- Cost
- I am concerned that if we do not clearly illustrate the current state of counties network and have data that shows usage and disparity during COVID-19 stay at home orders we may not engineer an efficient solution for future needs in the increasingly digitial world.
- It must involve the citizens
- The length of time it will take
- Sustainability
- Cost
- Don't know yet.
- No concerns about developing a plan - just want to make sure device access is also considered. (ie, not just cell phones - hard to apply for jobs or do homework on those)
- cost and maintenance burdening local gov't entities that are ill-equipped to manage networks in the long term
- assumptions that drive the plan
- n/A
- Government support to reduce costs
- Understanding affordability for our residents.
- The need for input and representation by potential service providers and technology experts
- That some citizens will not adopt the plan
- Cost
- Access to quality high speed broadband with regard to current technologies
- No idea as I am puzzled why this county only.
- Service provider interest. Citizen’s with disposable income to afford services.
- is it worth the money for companies to provide
- None

Q3. In what ways might homes and businesses across Bollinger County having affordable access to high-speed internet service improve the lives of residents of the County?

- being able to connect to the world means being fully a part of the world
- We would be able to access information on a much faster basis, and students would be able to do their work and raise their grades, Businesses would also be able to communicate with clients and executives faster.

- The pandemic is a perfect example as to why communities need good, reliable internet. Residents can work from home and possibly start new businesses.
- Provide them with more ways to stay connected with their community members as well as providing greater access to news and events taking place outside their community.
- Access to health care including information, data and telehealth, access to review and complete government forms, online banking and bill paying, access to student data from schools (far or near), access to friends and family far or near, ability to work from home, start a home internet based business, continue education online, etc. the list really goes on and on.
- They are too innumerable to list. I use internet for all my banking, paying bills, personal business, communication. Additionally, it must be available for schools for a multitude of reasons. Any kind of job application is online,and you must have an email to conduct all sorts of business. Internet now provides entertainment through games and streaming. I would think it would be difficult to buy and sell property if there is no internet; people coming from other locations expect it. Many of our appointments are scheduled online and results from doctors and other professionals come through portals where you must have an account to access the information. If a business does not have access to internet, there is no way they will move to our community as ordering, selling, communication with customers is all online. it.
- Access to more opportunities to be in the digital economy
- access to education and telemedicine. Also helpful to create and grow businesses.
- expanding their online learning, first response awarness, telehealth services, community engagement in solving community issues.
- More business growth; more options
- There would be a more available access to learning, online shopping, and communication which would effectively assist the growth of the community.
- Opportunity to promote county, communities, events to attract people/talent
- Opportunity for online education
- Greater buying power for goods and services not locally available.
- Opportunity for home-based businesses to start; opportunity for existing businesses to expand into e-commerce
- High-speed Internet access eliminates geography as a factor for education, employment and entrepreneurship. Through distance learning, distance working and the digital economy, high-speed Internet can positively improve the economy of a region.
- Affordable access to the Internet can be a path to economic mobility for residents and students as well as economic growth for businesses and local governments.
- It would improve access to education, telehealth and job functions (whether working from home or accessing information or training from home for other jobs)
- many
- formation of a cooperative with the sole purpose of mitigating buildout cost for ISPs
- I think this is pretty obvious. Increased accsess will bring them up to speed (pun somehwhat intended) with the rest of the mdoern world
- education, news, health care, the list could go on forever

- Access to more resources and options.
- Ability to take classes online
- Kids can connect with friends through video games
- Access to entertainment options (Netflix, HULU, etc.)
- More employment opportunities
- Keeping folks in their home towns, school, work etc...
- More apt to attract people to the area to live and work. Expand business economic developement. Citizen heath, telehealth.
- Increased entrepreneurial opportunities
- Access to education
- all residents will have equal opportunities for engagement in education, employment, healthcare, civic, and social activities, learning, and interaction
- youger people would be interested in living in Bollinger county
- they will be able to keep pace with the rest of the world

Q4. What types of businesses in Bollinger County would benefit the most if access to affordable high-speed internet service became available to homes and businesses across the County?

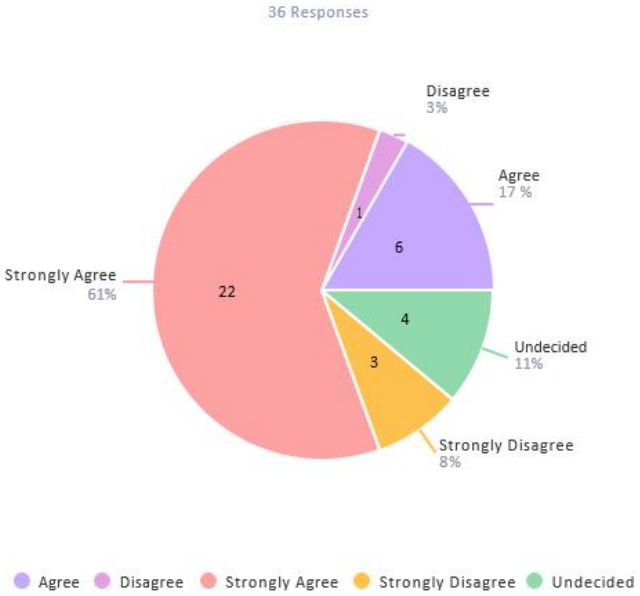
- Law, Education
- All types of businesses can benefit especially whether it being ordering goods online or the mom and pop businesses being able to sell their goods online.
- Agriculture, retail, factories, healthcare, restaurants
- Not sure at this time
- education, health care, financial... all businesses
- Communications, logistics, medicine, education related
- all
- all
- all business would benifet, the cloud will allow them to operate more efficiently in business operations by having remote access to accounting services, business counsulting, market awarness and serving as a community leader
- realtors, retail, entrepreneurs, tourism,
- I believe that all businesses would benefit.
- Medical, factories, opportunity for new businesses like call centers or data entry.
- All businesses that sell goods and services; those businesses that can provide services remotely
- All businesses will benefit through access to the Internet.
- Any of them - whether b2b or b2c, there are applications that can benefit any business type.
- remote workers for companies outside the county
- small indpenedlty owned, I would think.
- Medical, factories, opportunity for new businesses like call centers or data entry.
- hospitals, schools, virtually everyone
- Small boutiques that need to search online retailers for merchandise

- Any business that accepts credit cards (credit machines/ipads, etc.)
- All
- Retail stores, restaurants, etc..,
- Not sure what the business enviroment includes.
- In today's world, all types of businesses may benefit....

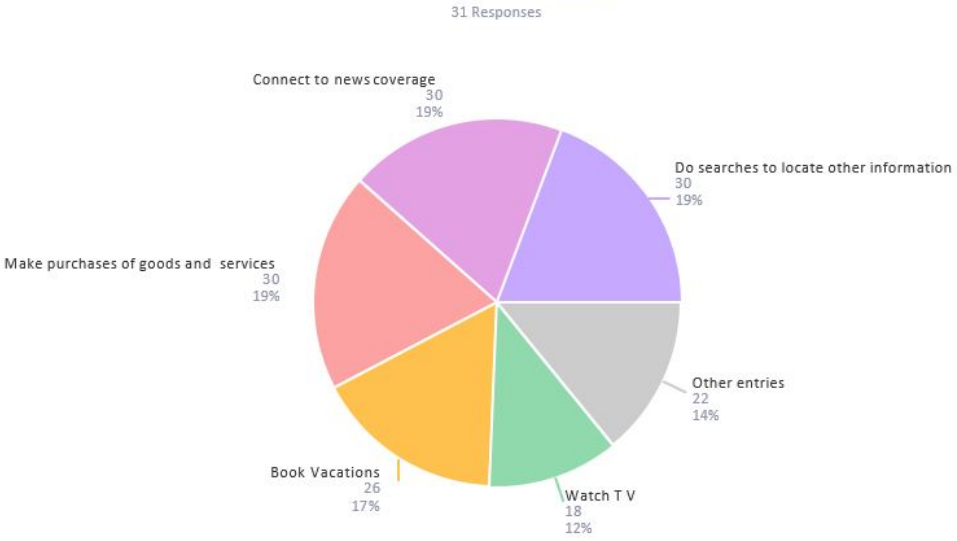
2. Reponses to Core Question #1 June 1 Live Breakout Sessions Survey:

A. *Responses to Likert Scale Propositions*

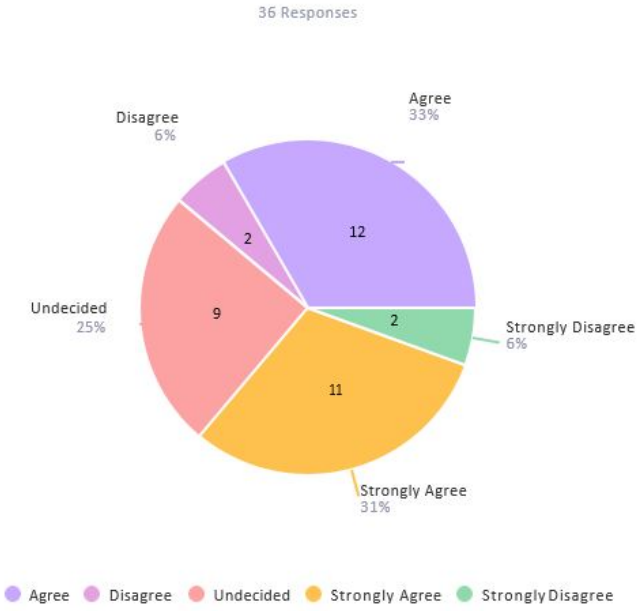
1. Having affordable and reliable high-speed internet service available to homes across Bollinger County would be very beneficial to residents of the County.



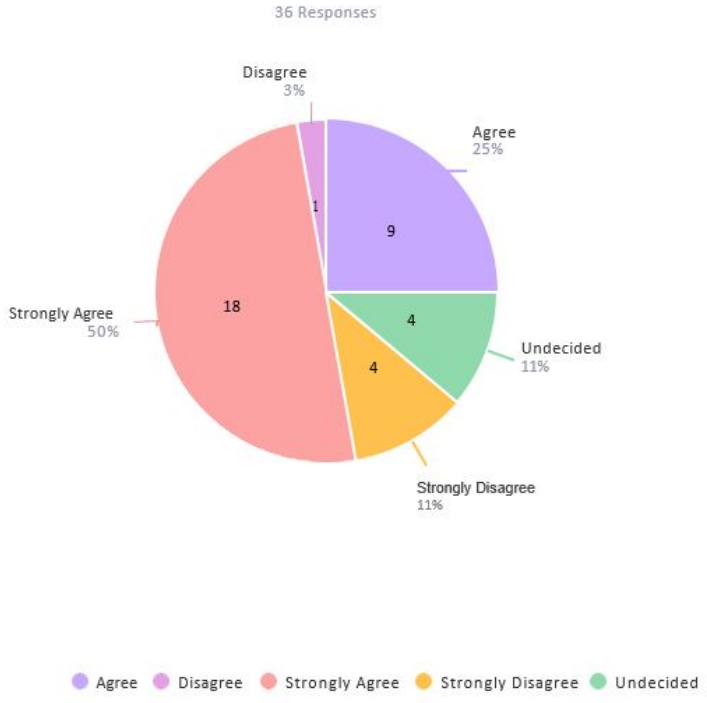
Do you personally do any of the following online? (please check each that you do online):



2. Having affordable and reliable high-speed internet service available to homes and businesses across Bollinger County would cause more young adults to live and work in the County.



3. Having reliable high-speed internet service available at affordable rates to homes and businesses across Bollinger County would improve local government's ability to serve its residents.



B. Responses to Card Sort Questions:

Q1. What do you believe are the main reasons why many people in Bollinger County do not have access to high-speed internet service?

- Cost to provide
- Lack of digital awareness for content, productivity and innovation
- The infrastructure isn't in place, and so far, providers have decided it's too costly to build it
- The infra structure is not available to connect to. They not be aware of the benefits of using internet.
- geography of the county, and level of infrastructure build out
- Infastructure issues
- Service is not available where they live
- Cost
- location of the residence/business
- cost of service
- no service available
- services not available at address (no line of sight, none offered)
- Cost and return on investment for providers.
- Terrain (hills and valleys) don't support easy broadand distribution
- affordability (too expensive)
- Less robust industry/business than more populated counties
- for profit business models don't work well in low density areas
- no service available
- not available
- No public options and private sector has not identified an "acceptable" (to them) ROI
- it is not offered
- Cost
- no infrastructure
- laws that prevent ease of setting it up
- cost
- Lack of population density (which results in lower Return of Investment (ROI)
- lack of infrastructure
- insufficient speed
- no infrastructure
- cost
- Large ILEC phone companies have done only minimum investment in the area
- There is an element in rural that can be characterized in two ways: stubborn attitudes and simple lack of awareness about how helpful high-speed broadband can be in their lives.
- cost, access

- Lack of solid Infrastructure
- Lack of interest from providers.
- Many may answer that it's a rural area, so companies don't try to connect them as much as big cities. However, it's also because the unemployment rates in this county are rampant and many don't have the money to pay for it.
- Cost of expanding accsess was too high, preventing companies from expanding their network
- Cost of development/installation
- Not having providers and I suspect cost is high given ruralness
- not available & if is costly
- linear density
- Low population and low ROI for providers
- Lack of access/provider availability
- Availability
- Cost/Affordability
- There appears to be only one provider and they have not built out the network to serve the need.
- Cost
- Expense related to development of infrastructure
- Lack of access by providers
- cost to build out the network
- Affordability

Q2. What people or groups of people should be included in exploring and developing plans related to broadband access in Bollinger County?

- ISPs, businesses, schools, local government
- individuals, businesses, students, educators, entrepreneurs, government, broadband providers
- Businesses, Health care, Education Elected officials and any one who wants to join in the cause to get broadband in our area.
- Residents in and out of town, broadband company, local government, local schools
- Businesses in the area
- County Commissioners
- Community partners
- Rural residents (especially farmers)
- All citizens should be included if they are willing to participate
- all sectors of the community to make sure it is representative of the community
- Community/county leaders, business leaders, public librarians and farmers using precision agriculture
- government entities
- residents
- businesses

- schools
- Residents: high school age, adults and older adults
- Electric Co-Op
- Public
- Governance
- Missouri Farm Bureau
- Community stakeholders
- Engineers
- Education, agriculture, healthcare, local government, chamber of commerce, local journalists
- Scientists
- public officials, business owners, medical professionals, school officials, and the end user (consumer)
- electric co-op board
- business, education, health
- Community betterment groups, alliances, service organizations (Rotary, Lions, Vets, etc.)
- students
- Cities of similar size and characteristics in other areas of country
- local businesses
- High school students
- I don't know Bollinger specifically, but in rural we must think about what groups and organizations people trust most. That is their neighbors, their churches, their schools, and some of their favorite businesses.
- schools
- chamber of commerce
- Bollinger 4-H
- Business community
- community institutions, businesses, associations, non-profits, local state agency reps, and elected officials
- those whose voices are not norally hard, but are feeling the lack of accsess the most- low income, POC, etc. Also- established local Community leaders, small buisness owners, youth likley to leave the county without accsess
- Broadband providers
- Schools
- Health care providers
- Education community
- City and county and state leaders
- educators
- first assemble task force, then talk to providers with BB assets in the county, work on asses inventories.
- County leadership, Local ISP's, State Broadband (Tim and others),
- local business
- emergency responders

- citizens
- Elected officials and government employees
- schools, hospitals, chamber of commerce, local government
- Libraries
- School Districts including students, parents and teachers.
- Citizens
- Citizens, govt., businesses, other organization including faith community pretty much everybody.
- business leaders
- Healthcare providers
- Education, Government, Private Business
- Homeschoolers
- City/county officials
- Community and school organizations.
- Manufacturers/Major employers
- Black River Electric, Wisper, Attitude
- Utility providers
- Everyone and every group - Internet access is essential to building community.
- Elected Officials
- equipment manufactures
- Residents, community leaders, business owners, ISP leaders, local technology groups that can be helpful to support the home users/devices
- Youth have a lot of great ideas that don't usually get to be heard!
- School Administrators
- local utilities

Q3. What are the best ways to get residents of communities in Bollinger County actively involved in exploring possibilities for high-speed internet access and uses in the County?

- Social media, town hall meetings, residents signing up for future service to know participation
- Contacting residences personally and inviting them to meetings
- Outreach to the community providing information and education.
- demonstration fairs and events
- An educational campaign to show some of the potential uses of broadband access
- public meetings
- [provide them with a method to do the planning questioning like we did with BLP
- grassroot meetings at schools, community events, etc
- Community working groups/task forces
- community outreach
- Bring the Internet first and ask them to try it
- Set up "showrooms" for them to use/test applications at shopping centers and other places they're already going and take short surveys of their needs/wants

- surveys - online via social media. they typically answer things on facebook
- depends on what the barriers are
- Survey of residents to sign up
- Hold some focus groups with free food as soon as it is OK to gather. Free food goes a long way. Maybe even a utility annual meeting or something.
- Build support from leaders across the county including students
- review cost benefits
- Community surveys
- Go to every meeting (when the pandemic is clear or you're socially distanced) and seek input and listen.
- explain benefits
- Focus groups, specific to group
- Group meetings
- provide it as a public infrastructure resources. plan in advance for equity with tools in place to make available to all households. think of high speed as a public good.
- educate in group meeting the many economic benifits of BB
- do an awareness compaign and make it easy by going to the people possibly using churches and businesses//other organizations (eg. library) to have townhalls. Obvi
- community gatherings where public input is invited and recorded.
- Connecting providers willing to serve and making sure they know State and Federal programs for funding
- explaining the short and long term benefits in order to make high-speed broadband a more appealing utility
- Provide. resources. I understand you have a website, but this whole workshop is about how people don't have access, so come to community events and talk to them. Come to school events and talk to the students about what it is and how it would benefit them.
- open forums, business engagement meetings, school and hospital leadership meetings
- We used the local newspaper and sent out surveys to the local residents through our utility bills to get responses.
- In library meetings via Zoom (during Covid), billboards with a phone # to call, fliers in co-op billing with information and education information, town hall meetings (social distancing) or outside safely, school board meetings, etc.
- launch a pilot zone that will show impacts
- Ask! A lot of Bollinger County residents are ready to help, but we need to reach out and ask for ideas

Q4. In what ways might widespread and affordable access to high-speed internet service change Bollinger County (whether positively or negatively)?

- People may be more apt to move especially with more work from home opportunities now. Getting more people back there will only help the economy.
- It's costly to install and for people to subscribe to
- access more information, job opportunities, and chances to innovate
- Increased access to education of all sorts - k-12, higher ed and continining education
- I see no negative affects

- It would provide residents access to online resources and commerce and would make it so people didn't feel they need to leave to get it
- increase revenue from business and outreach
- people moving in from outside the County wanting the rural lifestyle while still being connected
- Retention of population, economic development.
- increase in new businesses coming to the county or startups within the county
- Negative: reduced social interaction with people who live in Bollinger County
- higher educational attainments achieved
- positively be more business friendly
- Positive: access to information and resources from around the world via the interent
- we are an affordable place to live and work, so we are attractive to new business and people looking for a smaller place to live. having better internet would bring those businesses and individuals to bollinger county
- May highlight inequities in certain neighborhoods or areas of town
- Maybe higher/sustained population if WFH can be supported.
- Increased access to services (both government and commercial), education and healthcare
- not sure this is any different than Internet service anywhere; no special insight to Bollinger
- positive only - survey -
- More opportunity for educational advancement (online classes, degrees)
- Increased sales (online) for local businesses
- Economic benefit...opportunity for entrepreneurs to start-up
- Better ability to build community resilience in disaster recovery
- Increased economic mobility for residents
- access to services and employment
- better education opportunities; better access for businesses; better access to health and mental health care; better schools and govt services
- health care access
- Work from Home Opportunities, Better Education and Health care, increased home values. If we didn't know it before COVID is showing the necessity for quality broadband
- increase buisness growth and diverstiy, allow access to emerging telehealth field, alllw youth acccess to eductional resources in a post coivd world, intise young adults to stay and riase families, and new residents to move to the area for possible buisness growth.
- Not seeing a negative. Positively, it will open up economic opportunity as well as expand potential of service provision like telemedicine and educational opportunities.
- better workforce deveplment and growth.
- More growth and education and job opportunities
- positive improvements to all aspects of life and business

- It could open a whole world of possibilites for students and adults alike. From finding jobs, completing homework, etc., it would help us catch up wth the 21st century.
- Greater employment opportunities
- risk of exposing to security and stolen id's due to lack of experience
- I believe it would allow students to be more productive in school and businesses to be more productive in their companies. Also, it would help with keeping people at home instead of leaving to larger City's with better access.
- Greater access to goods and services
- access to more educational and business opportunities
- Entrepreneurial opportunities
- post covid-19 people will look for places that are affordable to live, remote working.
- More entertainment options (Netflix, HULU, etc...)
- Opportunities for education
- Access to telemedicine and telehealth
- Increase of business opportunities
- Population, graduation rates, businesses would thrive more

Q5. What concerns do you have about the process of developing a plan to make affordable high-speed internet service available across Bollinger County?

- the time it takes to develop the plan
- The residents' voices might not be heard and they'll be strictly left to the interests of the provider
- Cost and you need to know the interest. There is a reason why there is no access right now.
- Making sure that it is accessible to all people.
- making sure it is sustainable
- not a one size fits all or cookie cutter approach
- affordable options
- private interests and regulatory barriers getting in the way
- affordabiilty of the product
- giving people false hope. the cost. mixed messages. not doing it quick enough
- Cookie cutter solutions that don't meet the local needs
- How is access to devices managed or supported?
- Community not being involved.
- Who defines affordable?
- too much planning, not enough acting
- Lack of follow through, once plan is completed. As a state, we have done broadband planning at the local level several years ago, and nothing much happened. County must see some success (implementation) stories as a result of planning.
- getting a plan implemented

- The attitude of incumbent ISPs that have built strong legislative opposition to competition in the market.
- not sure
- need great leadership
- Provider that is willing to invest for a long-term solution.
- That the process will not be treated as a 'public good', but as simply a business opportunity that will leave many out.
- lack of governnet support.
- managing expections
- Funding and awareness of the vital need
- You have to explain the cost effectively and in ways we understand. They don't understand "fancy tech talk". Be honest with them.
- Ensuring affordability
- unknown
- Ensuring the plan serves the residents for the long term
- cost, management
- I would really like to see this expanded to the entire State instead of just one small county.
- providers are only interested in making a profit and not the development of the community
- Adoption rate due to fear of perceived government overreach
- What percent of people would use it

Q6. What suggestions do you have about the process of developing a plan to make affordable high-speed internet service available across Bollinger County?

- Need federal or state grants and to find out number of residents interested in broadband. Give all residents a survey with price points on what they would be willing to spend. That would help let you know if it is feasible. Maybe go door to door with survey. Broadband needs to be fiber. We even hear now 25 meg won't be enough. I wouldn't build anything less than 100 meg to a household now.
- Form a committee of interested people who are committed to this topic.
- Involve residents in the process and build support so that they can show broadband provider there's a market for service
- not sure
- funding
- Learn from other counties that have succeeded in deploying fiber to the home-it happens!
- involve the community
- be transparent and understand the community. if you dont know us come visit us
- Make sure supportive services (training, outreach, education on how to access and use services) is ingrained in process
- Community support
- Focus not only on access to broadband itself but the portals people use to get online
- not sure "developing a plan" is the right step

- Need good data on availability
- We need experts to develop a timeline of action
- Need leadership from community and providers - one without the other will not get great results
- Learn from organizations like Next Century Cities and the National Digital Inclusion Alliance. We are happy to help from Kansas City.
- remeber this is going to take some time and need not to rush the process.
- Do the equity work so that leadership of the initiative isn't the 'same old, same old' and people can feel comfortable participating. Treat it like 'emergency preparedness', not just typical ecodevo.
- involve experts and end users
- I would make sure that we are concentrating on the different areas of the state that are struggling to get broadband. Using this one county as a pilot is good, however I think different areas are have different problems.
- study showing network devices already used in county
- unknown
- Provide clear, frequent and truthful communications
- involve all stakeholders in creating solutions
- none

Appendix IV-B

Core Question #2 Survey Questions and Results

Survey question results

Q1. An important reason for low adoption of broadband is lack of confidence that people have in their ability to use broadband!

Participants clearly disagreed on this with 18 disagreements vs. 7 agreements

Q2. Rural citizens have low perception of the utility of broadband.

Participants clearly disagreed on this with 18 vs. 6

Q3. Affordability could be a reason for less than 100% penetration of broadband in Bollinger County.

A majority of the participants agreed that affordability is an issue

Q4. Is it important to have gigabit capacity in Bollinger and other counties for new and useful applications to be developed?

A vast majority agreed

Q5. Fiber-based technologies are indispensable for future proofing high-speed broadband networks.

Majority agreed (13) only one disagreed and 5 were undecided.

Q6. Wireless 5G will be the panacea for high speed broadband in Bollinger and other counties of Missouri.

17 disagreed vs 4 who agreed but 11 were undecided.

Q7. Do people with disabilities face barriers in using broadband?

Majority agreed

Q8. Gigabit broadband will require stronger cybersecurity and privacy protection mechanisms for consumers.

This was close. Ten agreed while 7 disagreed.

Q9. It is important to have free access to relevant digital literacy education for broadband adoption.

A majority of participants agreed to this.

Q10. Features of a broadband service are more important than its benefits.

A majority of participants were undecided. For those that did express an opinion, the majority disagreed.

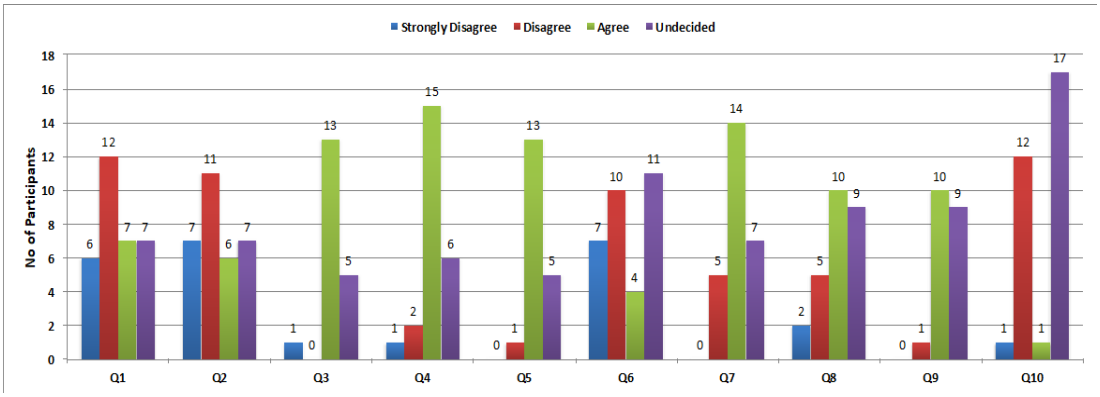


Fig 1. Responses to Likert Scale Questions

Summary of Likert scale survey

Bollinger County representatives appear confident in their ability to use broadband for various applications. They however felt that there was affordability issue in increasing penetration. They were in agreement about having gigabit broadband and fiber to deliver it. They are convinced that 5G will not be the solution for Bollinger. Many of them felt that stronger cybersecurity would be needed with gigabit broadband.

Responses to Card-sort questions

Q1 Why do you think is it important to have gigabit broadband in Bollinger and other similar counties?

- Broadband is a great equalizer. If you can do what your job requires in Bollinger County then you do not have to drive to Cape Girardeau. That creates a wave of benefits.
- Because of video for entertainment, work, study, telehealth, digital learning and small business.
- Demand for services will grow so plan for the future.
- Consumers do not need gigabit to have useful access.
- It is future proof and will save money in the long run.
- It would bring new opportunities to our community.

Q2 What would be the best way to assess the gap in Bollinger's existing broadband infrastructure and the needs? How can institutional, business and residential broadband demands be properly assessed?

- There have been several assessments done by regional planning, healthcare etc. We need more speed and bandwidth.
- There have been studies done on availability and speeds.
- Ask people what speeds to people actually get with the setup they currently have
- Use FCC data + resident/business surveys.
- Focus groups along with a quantitative survey
- Survey of every resident; survey of every business...what level of service they have, how they use it now, how they would like to use it, cost they are willing to pay, etc.
- Community surveys
- Perform download speed tests to verify actual speeds.
- Cost performance analysis.

Q3 What factors should be taken into account to choose the appropriate technology? Do you think fiber would be the right choice for Bollinger and similar counties?

- Fiber is a viable option due to the difficulty of line of sight options due to the terrain.
- It would be good to use fiber for most of the county and then wireless to the very remote areas
- Fiber is great, but not needed everywhere right now. Get fiber to hospitals, schools, etc. but consumers don't have to have fiber to have a better experience.
- Long term financial model - Yes – a Fiber To The Home (FTTH) solution that utilizes electric coop pole infrastructure
- (Consider) cost versus speed. Fiber is future proof and makes sense for any new infrastructure.
- Goal must be to achieve 100 percent coverage and 100 percent adoption. Consider the options that meet that goal.
- Terrain will most likely be an issue that eliminates some options.
- Accessibility. Some areas of rural Missouri are too remote and too rugged for reliable fiber deployment
- Yes-if working with the local electric coop can get access to longer term financing to make it affordable
- Fiber could be very expensive. Perhaps wireless is a better way ...
- Fiber is the right choice

Q4 What new types of services and applications will the network be required to support? Please comment on the importance of social applications (emails, news) vs. entertainment applications (watching videos, playing games).

- There is a demand for streaming entertainment.
- Neither social nor entertainment as a priority - those are secondary at best. Better educational resources, healthcare, business opportunities and improved people retention and property values.
- Telehealth needs with video capabilities
- Entertainment needs (video gaming, watch television)

- I think access to government services and heath are the most important. Social is nice but I think should be available at a higher price.
- Work needs...remote-in to work, work from home
- Prevalence of video will continue to drive bandwidth requirements within the home and business
- Social applications (email, FB, Instagram, etc.)
- Work from home systems, emails, news, movies
- E-mail, health, education, economic development are more important than games.
- Video and virtual reality use will continue to grow

Q5 What type of technology training and service support would the community consider necessary? Will community residents be forthcoming in setting up these facilities?

- There will be a need for technician training, not as much for basic use.
- Community should offer support for helping potential users learn options and benefits of adopting high-speed access. Residents need to step up to take advantage of these services or do their own discovery of best uses.
- Would need some community access sites for training...or access to really good on-line tutorials.
- No-cost access to training on most common software and applications
- Residents will need lots of support. Maybe this can be provided through the school system.
- We can use most equipment, training for seniors
- The local chamber of commerce may know it better.
- Not necessary. If you build it they will come

Q6 Can telephone and cable companies deliver broadband at gigabit speeds in Bollinger County? What kind of partnership will be best suited for this purpose?

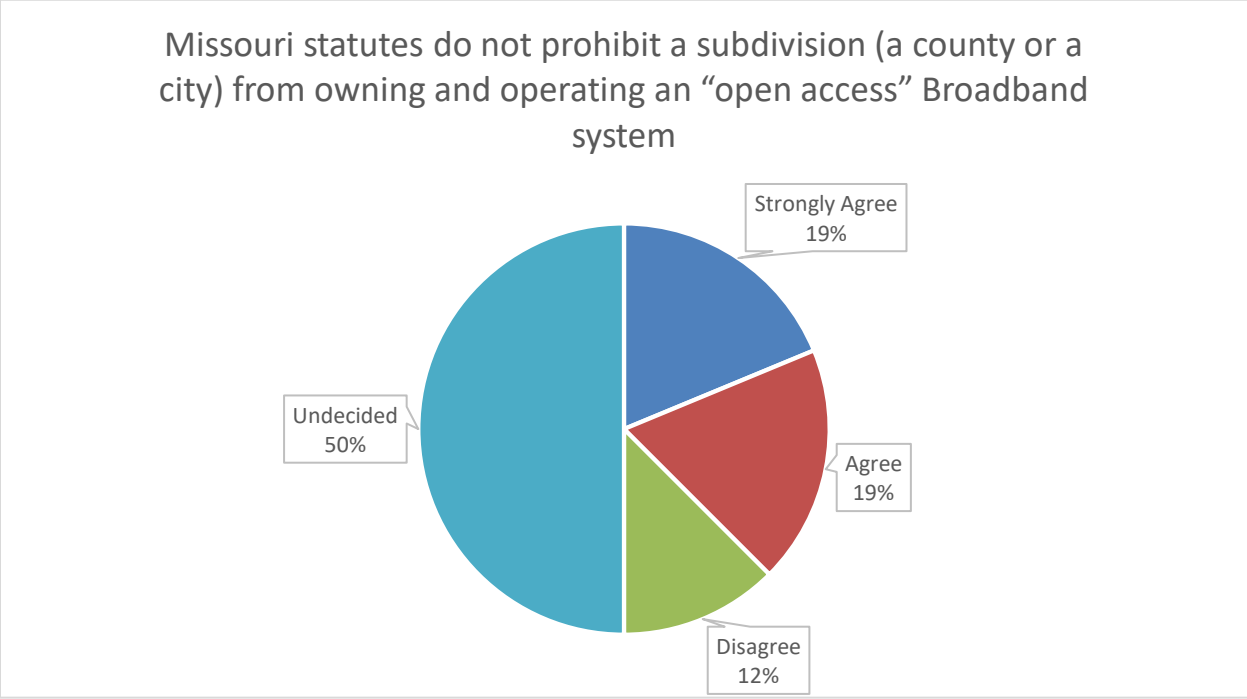
- We have a possibility of a partnership with the electrical utility to use infrastructure to deliver fiber to the curb, due to the expense and poverty rate of the county, this is a good option for keeping costs low.
- What is the hang up with 'gigabit' speeds. My ask would be the technology exists for these companies to do that now. Why aren't they doing it?
- Depends on the economics and subsidies.
- Yes. Requires government subsidy to build out to the required bandwidth / technology.
- Yes, if they will
- They do not have the customer density to deploy to everyone.
- Just a matter of funding

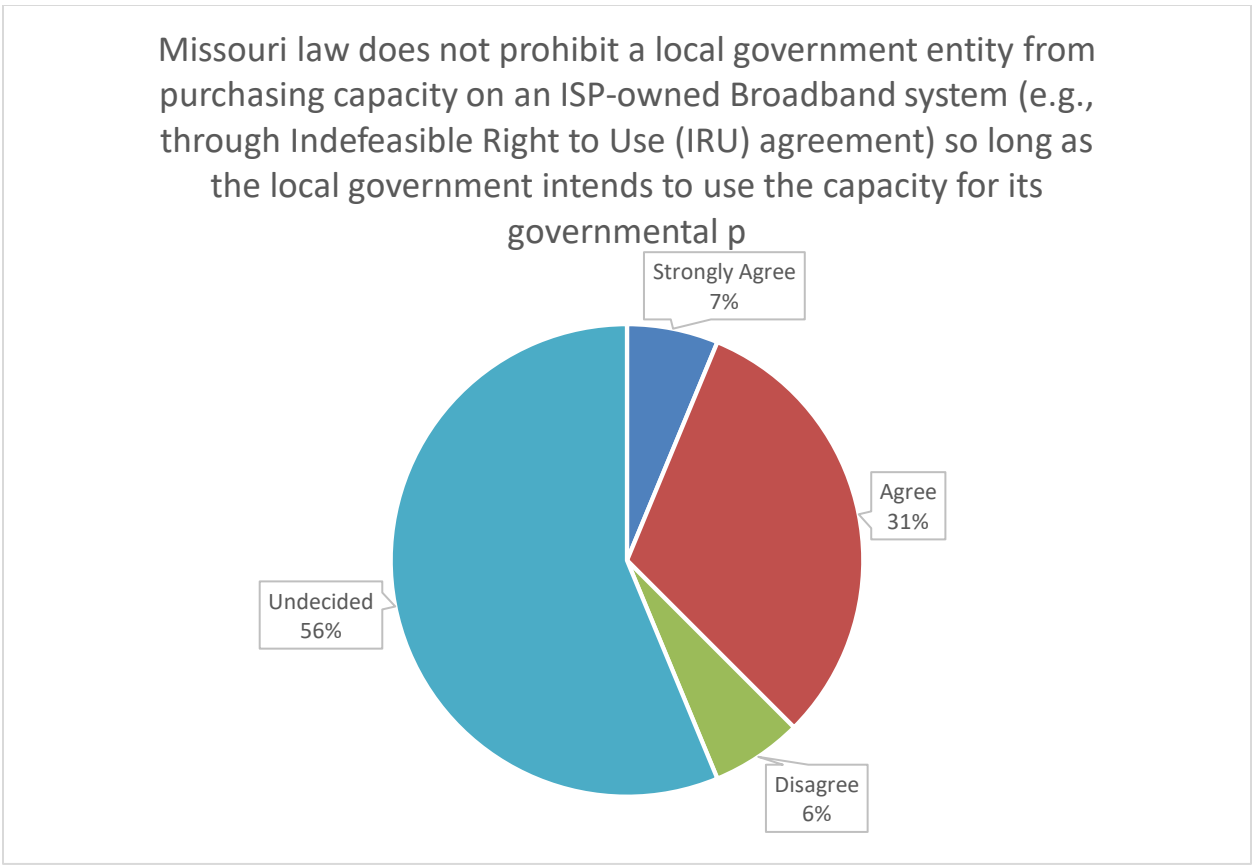
Q7 What, in your view, will be the main hurdles in achieving the goal of 100% high speed broadband penetration in a county like Bollinger?

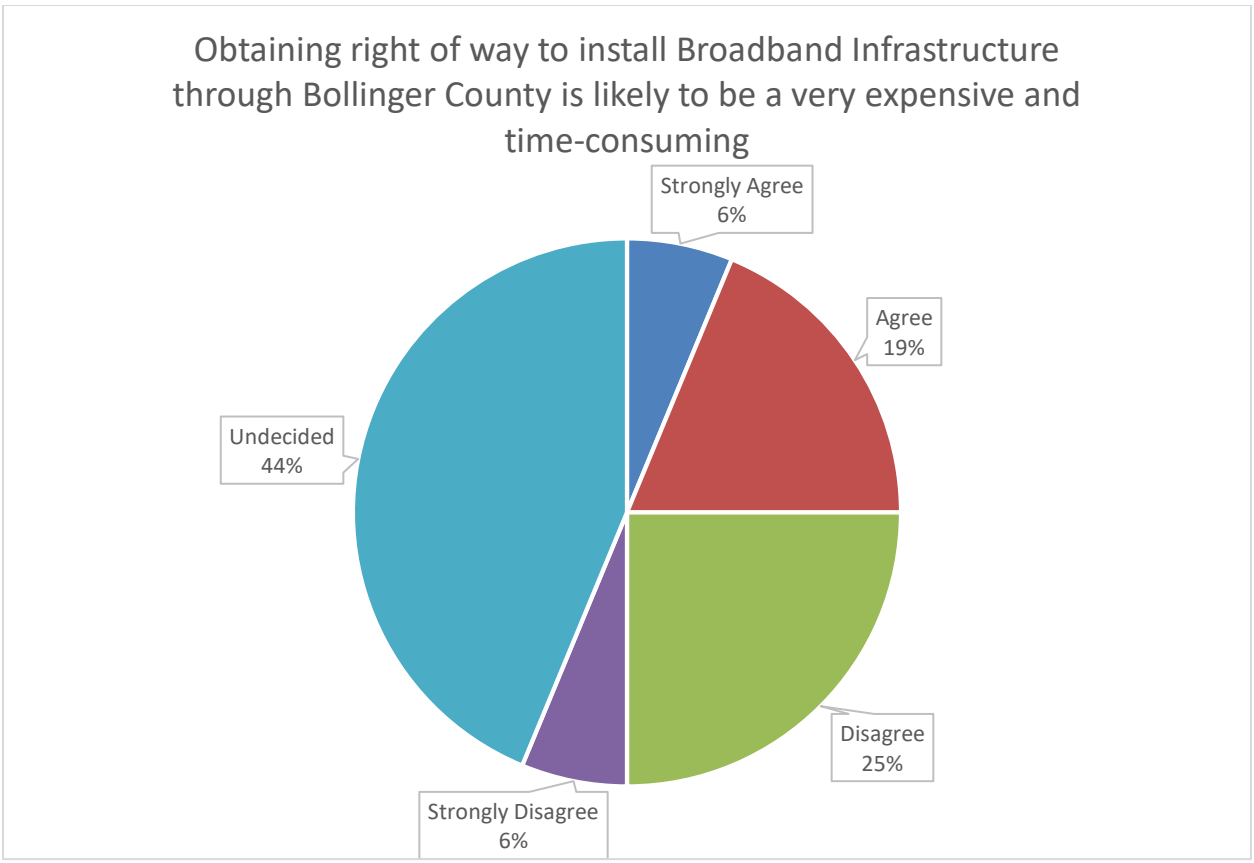
- Terrain
- Finding providers and/or developing public-private partnerships who are willing to invest in technology
- Deployment high-speed broadband technology can achieve 100% reach, adoption will be based on family economics and choice.
- Cost and affordability
- Funding

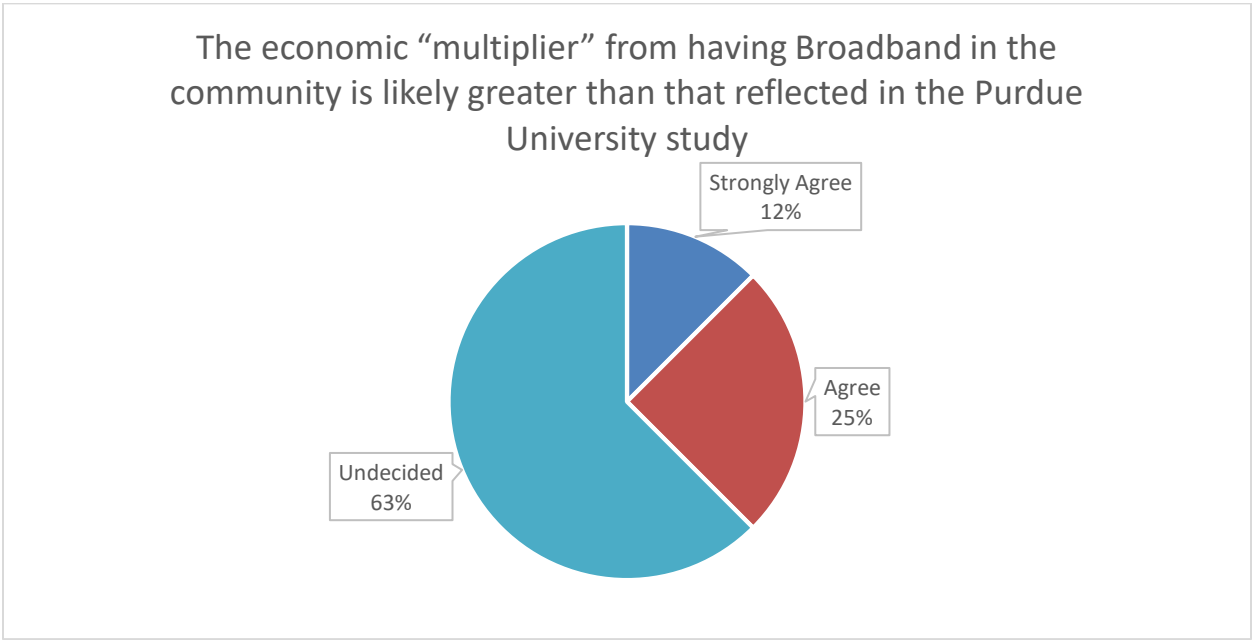
Appendix IV-C

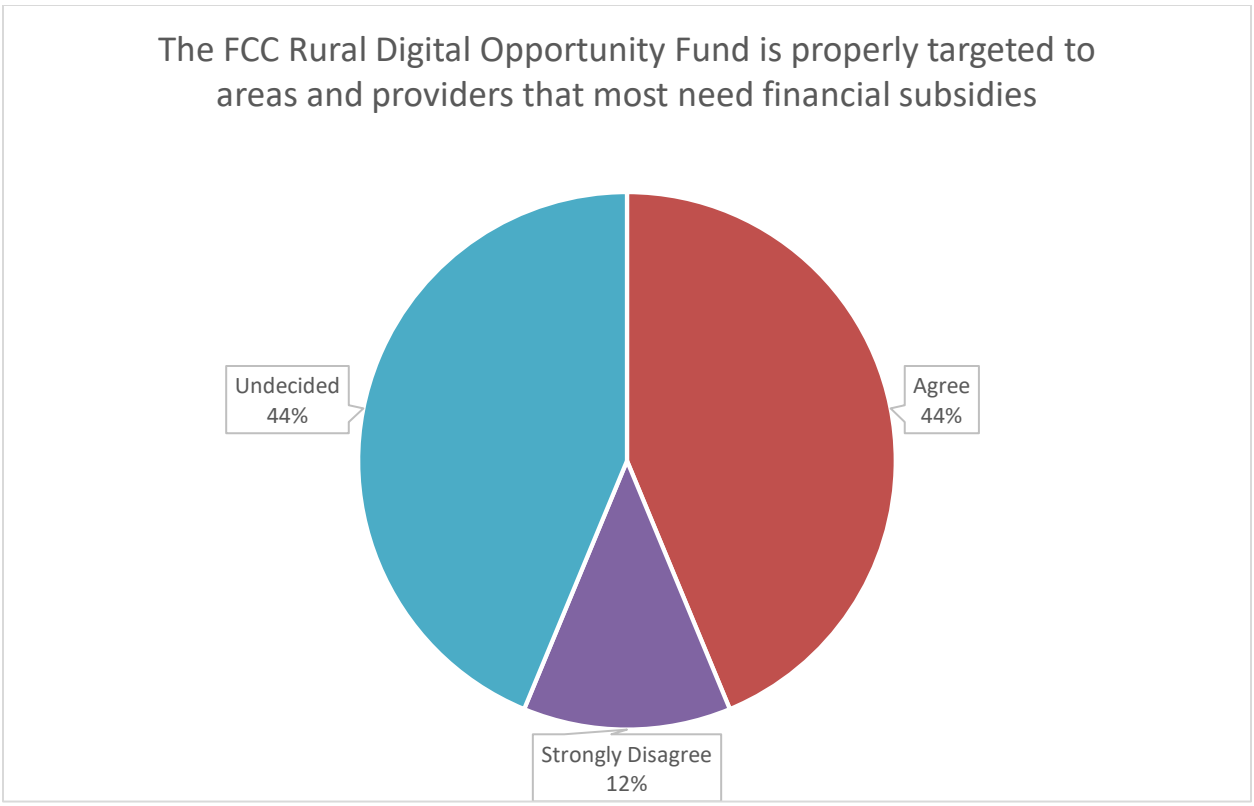
Core Question #3 Survey Questions and Results

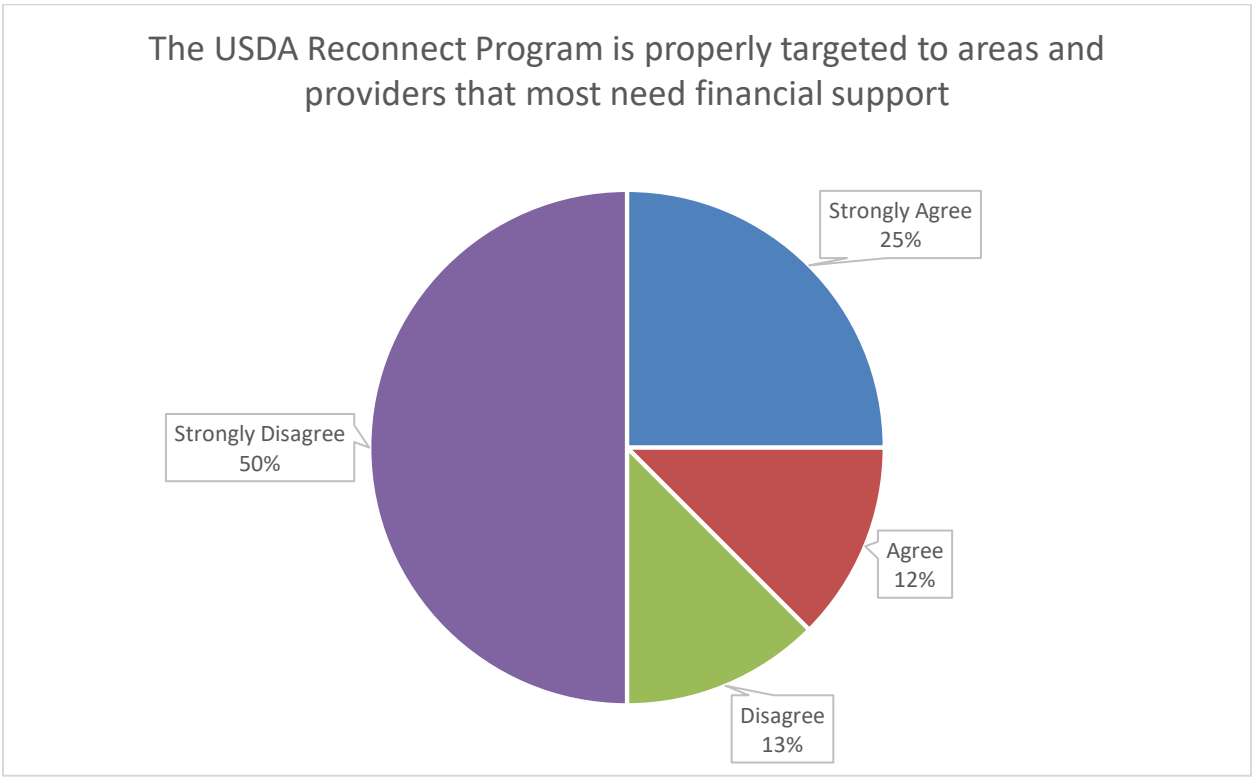


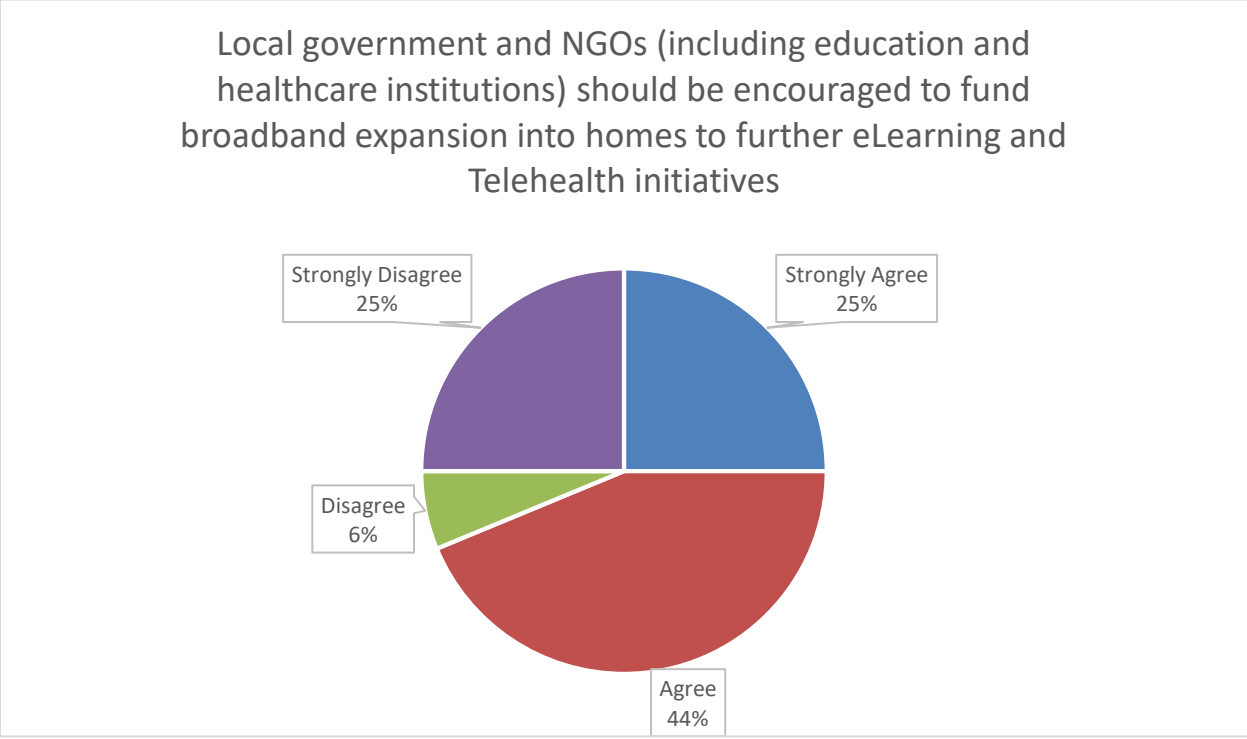

Missouri law does not prohibit a local government entity from purchasing capacity on an ISP-owned Broadband system (e.g., through Indefeasible Right to Use (IRU) agreement) so long as the local government intends to use the capacity for its governmental p
Strongly Agree 7%
Agree 31%
Disagree 6%
Undecided 56%


Obtaining right of way to install Broadband Infrastructure through Bollinger County is likely to be a very expensive and time-consuming
Strongly Agree 6%
Agree 19%
Undecided 44%
Disagree 25%
Strongly Disagree 6%


The economic “multiplier” from having Broadband in the community is likely greater than that reflected in the Purdue University study
Strongly Agree 12%
Agree 25%
Undecided 63%


The FCC Rural Digital Opportunity Fund is properly targeted to areas and providers that most need financial subsidies
Undecided 44%
Agree 44%
Strongly Disagree 12%


The USDA Reconnect Program is properly targeted to areas and providers that most need financial support
Strongly Agree 25%
Strongly Disagree 50%
Agree 12%
Disagree 13%



What would a governmental entity need to do to convince investors to finance the cost of Broadband Infrastructure?

- strong financing and business plan
- Provide use, importance and most of all, a well-planned strategy with a ROI
- Some type of incentive such as free access to the fiber for their business or home.
- Engineering Model and ROI
- Guarantee an adoption rate of the service among citizens that ensures the cost of development and service is recouped by having citizens sign-up/commit beforehand.
- Develop a community-wide broadband demand analysis (fixed/mobile/residential/commercial) and share with
- have an anchor customer to justify build costs
- High probability of cost recovery
- First and foremost, a solid business case of the cost to build...the use...and the revenues
- Offer matching grant funds
- Guarantee a supra-competitive ROI
- Own and back the underlying infrastructure.
- must be able to show stream of revenue to pay obligation

Before Bollinger County could implement a Government Sponsored Open Access Broadband System it would need to address to following the legal or economic issue.

- recheck state law for org options i.e. nonprofit, co-op muni.
- Not familiar with local politics and structure but in my mind, I would say the local citizens
- I think they should legally have the right to provide an internet service it would be the economic issues that would make sense.
- Can the cost of service be offered at a price point that is low enough to help ensure a high rate of adoption among residents.
- Business model
- The FCC has funded buildouts via CAFII and the new RDOF will provide funds...how does this open access network work within this environment with commercial entities getting government funding

What would a local government need to do to convince voters that it should assist an ISP's capital investment by buying long term rights to capacity on the ISPs system?

- Provide a what's in it for them proposition and a guarantee that the distribution will be equitable
- show widespread econ dev benefits
- It would be hard to do this because the cost to place fiber is expensive and not being able to provide some type of incentive would make it much harder.

Besides local government, what other entities/groups might be willing to financially assist an ISP to fund a Broadband system

- FCC/USDA
- Utility companies looking to open another line of business.

How can the economic benefit expected to be realized by the public through the utilization of broadband be monetized and used to support the effort of an ISP or a government to build and operate broadband in the community?

- Work from home / telemedicine cost savings.

Appendix IV-D

Core Question #4 Survey Questions and Results

(1) What is broadband access?;

- opportunities for community growth through education and access to the world
- Internet connectivity at a speed that supports business, school, shopping, and streaming video 24/7
- computer access to internet with sufficient speed to support high tech
- a way to get on the internet at fast speed
- The abilitly to connect, engage with, and bennifit from high speed internet at the users need/desire
- Internet that allows a multitude of parties to access the resources the internet has to offer.
- Ability to learn about anything
- Sufficient connectivity to access online resources as needed (currently defined as 25 Mbps down/3 Mbps up)
- Connection to all information
- high speed internet
- Symmetrical speeds of at least 10 Mbps up/down
- consistent high speed with no interruptions in service regardless of geographic area or number of people on.
- Very quick (near real time) internet
- the infrastructure to select internet providers based on cost options
- Access to high speed internet - both up and down speeds
- A high-speed connection to the internet
- Broadband service that is easy to access and affordable for every citizen
- being able for students to do homework over the web
- always on 25/5 down/up internet speeds at least
- 24/7 access to the internet
- Reliable access to the internet greater than 50 Mb/S
- the ability to have reliable, high-speed internet access
- having high speed internet at my home and work

(2) How would Bollinger county look different with broadband access in both positive and negative ways?;

- more education access, better business, healthcare access, better govt services
- It would bring about the ability for resources and opportunities we don't necessarily have. Some people might be weary of it because "big brother is watching", but it would

help people find and possibly even create more jobs, and that's needed considering our unemployment rate.

- Greater access to healthcare resources from afar (telehealth)
- Possibility for more people to work remotely for larger companies not headquartered in the area that can pay higher wages than local employers. More earnings in the county
- more businesses likely to locate in Bollinger County
- Increase in businesses to benefit the residents (both for employment options and as consumers)
- better educated students
- Residents would have more ability for economic mobility
- Overall quality of life would improve, likley se a higher number of young adults stay in the area, and new families, under the age of 50 moving in.
- We could see population growth
- Ability to access online learning (K-12 and higher edu)
- better health care access
- Positive - Bollinger County can then participate in the global knowledge and information economy. This gives the county an opportunity to digital transform its government, education system and economic development ambitions. This is the pathway to bringing advanced manufacturing opportunities to the county and the creation of 21st century careers
- + be able to access new tools - cost
- Positive - Bollinger County can then participate in the global knowledge and information economy. This gives the county an opportunity to digital transform its government, education system and economic development ambitions. This is the pathway to bringing advanced manufacturing opportunities to the county and the creation of 21st century careers
- Everything revolves around internet. Positive impacts on individuals, communities and county. Positive on distance learning, telemedicine, economic development and quality of life. Negative - mainly the privacy issue but that should be user managed.
- Negative: there can be a loss of connection to local people and information when accessing interet based information outside of the County
- Not sure
- everyone would have access to additional services, such as tele-health and online education, to improve the quality of life
- + business development, greater offerings for residents to take classes or work from home, + revenue from new businesses and attracts people to move into the County negative-some resistance to change for some residents, new way of life introduced to the County
- Positive: Residents have access to online resources, commerce. Negative: Infrastructure in view and through previously open spaces
- positive, improve access to rest of world, raise prop values, allow for remote healthcare, education. Negative: may lead to less personal interaction, may lead to businesses losing sales to online stores
- Online shopping access that could lower sales tax revenues locally.

- Positive: increased ability to connect with people and information outside of the County
- increased access to services in community/buying local
- positive - higher quality of life
- Maybe higher/sustained population if WFH can be supported.
- Will allow for more businesses to locate to Bollinger County.
- positive more business friendly;
- Increased access to educational resources - even peer school district to district
- more built infrastructure in public right of way to support networks

(3) What's the largest barrier to broadband adoption, assuming that infrastructure is available? (As a follow up, we asked participants "why?" five times to determine the root cause);

What's the largest barrier to broadband adoption, assuming that infrastructure is available?	2. Why?	3. Why?	4. Why?	5. Why?	6. Why?
Stubborn attitude about Internet and change	because people don't like what they don't understand	because when they don't understand something, they feel less than others	because they don't want to sound stupid if they ask questions	because asking questions is hard...being fed information that is easy to grasp helps everyone feel smart and more open to change when they see benefits	
In Bollinger County - it's lack of broadband infrastructure	Low density of available customers	Large rural county	This is the way this part of MO was populated	Access to transportation and resources	OK this is too far away from the question
lack of organization	not knowing what needs to be done and have a timeline	Don't know how to get experts	Need to find someone to give us a timeline	to share their experience for implementing	to know what to do first
cost has to affordable	satelite is to costly	cost to bring this option			
For most of our county, the answer would that they are afraid of the cost.	Because many don't have the funds that might be needed to pay for this service.	Because many people don't have jobs.	There are not a lot of places that offer jobs.	Because we don't have the access to find them outside of our bubbles.	Because there is no broadband access
Cost	number of people in area	rural area	littel opportunity	no businesses	rural area
Understanding relevance	People don't think they need it because they've gotten by without for so long	They don't think it's important enough to pursue	It's too much hassle	Costs money they don't need to spend	
cost	It can be too expensive with poor results	People do not want to invest in something that doesn't work well	Cost benefit ratio is low	because entire communities need to commit and make	Common good for all from individuals to

				access equitable to all regardless of ability to pay	employers to economic impact
landscape in some rural areas	remoteness	hilly areas			
Affordability	Because sometimes only one provider exists and their rates are too high	Because it's too expensive for other providers to build	Because they don't know how many actual homes and businesses would subscribe	Because they don't have good data on need or interest	Because we haven't really drilled down and asked the right question of residents and businesses :)
Cost	Low wage earners	Lack of high paying jobs	Few incentives for employers to locate to community		
To coordinate all parties to work together to be able to access it and share the cost	Costly for each individual to afford it.				
Cost	dont see the benefit before using it, so why pay for high-speed access	need to experience high-speed to see how it changes use and saves time	if given chance to try it, maybe would help them justify additional cost	by seeing the benefits, can help them justify the benefits to the expense	show customers what could be with high speed
Lack of ability to make full use of online capabilities	Many people, especially older, don't have knowledge or experience how to access online services	They haven't seen anyone else or know what's available	They haven't been educated on services available	There's little basic training available on what's available and how to access	There's no profit in helping with basic training - especially hand holding and answering questions
cost (affordability)	lower socioeconomic status	not a lot of industry to keep and retain employees	businesses are often not motivated to locate in Bollinger County due to lack of resources (both Internet access and educated workforce)	no resources	

Adequate devices for all needs	devices are expensive and families may not be able to afford multiple devices	income levels may not meet the budget needs	economic instability and lower wages are widespread	rural areas may not have access to higher paying jobs	supporting infrastructure to accommodate large workforces
geography	it is full of hills and valleys	the people in the valley's will not be reached because of line of sight	again not everyone will have access	we are back to the original problem	
Habits -> Lack of broadband -> Lack of infrastructure -> Lack of economic incentive	Habits	Lack of broadband	Lack of infrastructure	Lack of economic incentive	
Cost of service	To expensive	lack of competition	limited infrastructure for full market competition		
Content which is the ROI driver	Is it being used for education, workforce development and commerce vs. entertainment	content is king	content drives adoption	content leads to commerce	
Cost of service to end user	low income recipients	lack of provider options to select from	individual service packages are not available, i.e.. some need faster speeds, more data, need more options	Rates are too high	
Cost	Broadband access can be expensive	Technology can be expensive to deploy	In rural areas population density is not as great as an urban area	therefore, the cost per each subscriber is higher	

(4) How can we increase broadband adoption rates?

- Let the electric utility and local governments cooperate on building the Internet infrastructure
- Get our electric coop on board as a partner
- involve agencies/organizations/businesses/informal leaders/govt/faith community
- Build empathy with the stories of students doing homework in a car in a parking lot or burning wireless data through using phones as hotspots.
- Make it available
- Share relevant "Before and After" stories of people in different roles who have started and increased usage for more than just email and web browsing. What do those capabilities translate to in daily life.
- Help educate new potential providers on state and federal funding that could help fund their buildout
- Provide examples of relevance in the examples of school, work, shopping, online engagement, and economic mobility
- share / educate opportunies what broadband can do for everyone
- Include benefits for health care, education, and economic impact
- Plan well and be inclusive with those involved in planning
- Help providers understand homes and businesses that would truly ADOPT it if new infrastructure were built
- make sure people know about it
- Show examples of how similar communities have benefited
- By showing people what broadband can do and what we can accomplish with it.
- Training individuals on use and benefits
- grant based subsidies (term based) to encourage early adoption.
- Truly understand what current provider options exist
- Educate our residents and business owners
- Explain and illustrate benefits
- Offer price discounts or supplements
- Provide information and education on the benefits of BB
- Careful marketing campaign
- Include daily use of applications (education, health, business) - content
- Show an equal distribution between town and rual areas.
- Provide a variety of bundles
- Education about uses: i.e. lower costs for tv programming than dish/Direct.
- include internet courses in school as ubiquitous as typing classes once were
- Lower cost
- make it affordable for everyone
- control cost and educate users
- education, demonstration, COVID isolation actually will help drive adoption
- Provide necessary equipment for free
- Keep cost down and demonstrate value to users by showing them what tools they can access
- less cost

- Lower cost
- increase ability for municipal broadband
- Make it cheaper.
- Provide access to adequate devices at varying rates
- Affordability
- Content
- Create equitable cost options

(5) How can we describe success for broadband adoption?

- Students, business and government are able to continue with their activities in a work from home environment
- 50% adoption rate
- Median income increases by 20%
- Getting our electric coop to agree to be a partner.
- more business opportunities and more employment
- Population growth (more staying or coming to the county to live)
- Everyone who wants to access broadband is connected
- New businesses opening in the region
- When everyone has the same ability to access the Internet to power their actions online, whatever they may be, the same as they can access electricity, we've won.
- more equitable education
- students that gain access will be engagement more in school
- I really dont think you can call it a success until 100% of the populaiton has the abilitly to connect to high speed.
- Actual adoption rates would be lower, of course.
- Student achievement
- better and more accessible health care
- Number of new homes and businesses connected, beyond current baseline
- Success is when all have the access they need to improve their quality of life.
- Seeing a change in our community, physical or not.
- more businesses
- Local GDP increases dramatically
- Increase in new users and new innovation
- several metrics: rate of adoption, decrease in emigration from county, increase in property values, improvement of school performance, (student performance)
- available speeds for users, number of households signed up for the utility
- everyone has access to high speed internet that is consistent and affordable - just like electricity
- high adoption, increased commerce, services, entrepreneurship, job creation and economic development
- More people to buy-in and affordable for everybody
- County residents use the internet effectively and safely and feel satisfied about having it

in their lives

- The citizens are able to have "what everyone else has" per Wayne
- All that want or need it have it.
- 80% utilization county wide
- when every resident and business owner has choices that support their needs
- We have access in some fashion for all residents