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Digital Utilities: The Factors Impacting Municipal Broadband Decisions Among Local Leaders

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0 - Initializing

Can a better connection to cyberspace revitalize a real-world place? Many residents of Chattanooga, TN believe so. A burgeoning creative economy has turned Chattanooga into an agglomeration of technology firms and a magnet for human capital from across the nation (Lobo 2015). While Silicon Valley, Austin, and Boston's Route 128 rose to prominence on a foundation of elite universities and cutting-edge defense research, Chattanooga's innovative journey began somewhere more prosaic: a municipal electric utility. In 2010, Chattanooga's publicly-owned electric power provider, EPB, harnessed a $169 million loan and a $111 million federal stimulus grant to upgrade its fiber-optic-based 'smart grid' from an outage monitoring system to a full-fledged broadband Internet service provider (Koebler 2016). EPB overcame four lawsuits and an intense public relations campaign funded by incumbent telecommunications companies with the intent of discrediting municipal broadband. Today, their network offers connection speeds up to 10 gigabits/second, the highest available anywhere in the United States (Koebler 2016). By stimulating competition among ISPs and raising the speed of available Internet connections, municipal broadband can help attract new firms and bolster the capacity of existing firms to create jobs and higher-value products.

0.1 – Research Questions

This study was inspired by a common colloquial question heard from members of the public and community stakeholders: "I could certainly use a faster or more reliable Internet connection … why doesn't my community have municipal broadband?" To address this issue, this research explores the key question of

- 'What incentives and disincentives impact municipal leaders as they make decisions regarding municipal broadband?'

Related questions include:

- 'In both perception and actuality, what are the most significant benefits of and challenges to implementing MBNs?'
- 'How do municipal leaders learn about municipal broadband to gain information for making such decisions?'
- 'What are municipal leaders most interested in learning about municipal broadband?'

By definition, local government institutions rather than private citizens implement MBNs, so the analysis foregrounds the perspective of municipal managers and administrators. This research aims to identify effective professional development strategies for MBN education. It also aims to uncover:

- ‘How do those in positions of authority and influence perceive MBNs?’
- ‘How does professional development affect their perceptions?’
- ‘How do unique community characteristics influence MBN development?’

Additionally, since the field of municipal broadband evolves at a rapid pace, this research seeks to learn about

- ‘What plans do communities have for the future of MBNs?’
- ‘How do co-constitutive managerial and citizen advocacy factors shape the next generation of local Internet innovation’?

Today, citizens of the U.S. continue to face persistent broadband access inequalities, especially in impoverished inner-city areas and in rural areas with a low concentration of users per square mile. Following the deregulation of the American telecommunications industry, “providers seek to avoid … areas (where low densities inhibit economies of scale)” (Warf 2013, 125). When infrastructure investments are guided solely by market economics, “service providers are simply not incentivized to enter the market in rural areas” (Chary and Aikins 2010, 43). Positive feedback loops create a path dependency for economic development, as wealthier regions with higher levels of population density become even better connected due to lower broadband provision costs in such regions (Malecki and Moriset 2008). In a deregulated market environment, firms are free to engage in the “’cherry picking’” of markets that provide a high profit margin and the commensurate “’social dumping’” of less-lucrative customers (Graham and Marvin 1996, 205). Solutions to these inequalities demand the creation and maintenance of alternative systems for service provision in the American telecommunications sector.

Socio-technical systems include both technological aspects of infrastructure, as well as individuals working within an organizational context (Baxter and Sommerville 2011). “Place-specific impacts” influence these actors as they understand and manage transitions, providing a lens by which the discipline of geography can analyze socio-technical system development (Coenen, Benneworth and Truffer 2012, 4). Such systems evolve in response to selection pressures. Socio-technical selection pressures include quantitative macroeconomic factors, as well as qualitative cultural attitudes and trends (Smith, Stirling and Berkhout 2005). For instance, a case study of information services operated by Southern California municipalities showed that “the choice of technological paradigm” was primarily influenced by the “background and professional training of the developers” (Graham and Marvin 1996, 109). Broader patterns in public sector cultures can also impact technological choices. Political scientist Daniel Elazar identified many Midwest states as having “individualist” political cultures that “place a premium on limiting community intervention” in society and the marketplace (Elazar 1980, 275.

"Coalitions of social interests" including both business and policy leaders control infrastructure systems within municipalities (Hodson and Marvin 2010, 478). Utilities are key components of sociotechnical regime constructors (Smith et al. 2005). Lawhon and Murphy identified the need for "policy-makers, technologists, consumers, entrepreneurs, (and) civil-society organizations" to "redirect a regime and the systems it is part of toward a more socially … sustainable direction" (Lawhon and Murphy 2012, 359). For instance, Graham and Marvin posit that "the protection of marginal…consumers from 'social dumping' is a major concern that needs to be addressed by city governments" (Graham and Marvin 1996). Competition, such as that created when consumers can choose between municipal and investor-owned networks, is a form of sociotechnical selection pressure. Greater levels of competition are necessary in the American information utility sector due to the rapid consolidation through waves of mergers that occurred in the late 20th-century period of deregulation.

0.2 – Public Sector Power

Municipal broadband provision is an example of individuals working within an organizational context to establish more sustainable sociotechnical systems. Municipal broadband systems, or those owned and operated by a town government rather than a private company or non-government cooperative, have great potential to improve quality of service and social equity for millions of Americans. Such governments can help "serve … forgotten" groups of users by choosing to "experiment and pioneer systems that meet local needs" (Sandvig 2006, 505). Municipalities are uniquely well-positioned to provide broadband access due to their existing ownership of right-of-way and experience in providing utility services (Bar and Park 2006) (Koch 2018). For instance, large municipal utilities have developed some of the most innovative demand-side-management (DSM) strategies in the electric power industry (Wilson et al. 2008).

The major gateway factors to establishing a municipal network are the presence of a municipal electric utility and the creation of an intranet for municipal employees. For municipal electric utilities, fiber connectivity is an attractive value proposition because it can provide outage and maintenance information, as well as generate additional revenue (Walton 2014). The convergence of multiple types of infrastructure and services under a mutual framework reduces the cost and environmental impact of service provision (Camci et al. 2012). Infrastructure components that share right-of-way and patterns derived from common management practices often take the form of a technological palimpsest over time (Mattern 2015). The plethora of technologies used for municipal broadband shows that the creative aptitude of municipalities transfers readily from electric utilities to broadband utilities.

Community-wide broadband systems often begin as small-scale systems limited to municipal operations. Before being expanded, these systems improve

communication within city departments, such as public safety, hospitals, and libraries, and are used for SCADA (Supervisory Control and Data Acquisition Systems) at power and water plants (Kelley 2004). For instance, Chattanooga's highly successful municipal broadband network originated from an effort to connect 'smart meters' used by that city's electric utility (Littlefield 2014). The resulting 'smart grid' reduced the duration of power outages in Chattanooga by 60 percent, saving local businesses $45 million (2015a). 'Smart meters' also improve the cost-efficiency of utility operations by reducing the significant labor costs associated with manual meter reading (Graham and Marvin 1996)

0.3 – Promoting Prosperity

Broadband technologies may be relatively new, but government partnerships are a proven way of expanding utility access in rural areas. For example, public-sector efforts promoted rural electrification in the early 20th century (Koch 2018). During the 1930s, the Rural Electrification Administration provided federally-subsidized loans equivalent to 0.3% of the national GDP, which helped double the number of farms receiving electric service in just five years (Kitchens and Fishback 2013). Today, public-sector broadband utilities could meet the education, health, and economic development needs of 21st-century communities. Rather than shutting out private providers, they create an additional choice that stimulates competition in the broadband provision space. This leads to reduced prices, improved connection speeds, and greater rates of customer adoption (Lai and Brewer 2006).

The scope of empirical data linking municipal broadband to economic development is limited due to the relative novelty of municipal broadband and the small number of existing case studies. However, current research suggests a promising trend. A 2018 literature review found positive correlations between broadband adoption and access and increased levels of new firm establishment and attraction in rural areas (Gallardo, Whitacre, and Grant). Broadband adoption and access is also linked to growth in sales, payroll, and household incomes in such areas, and provided benefits in sectors ranging from agriculture to health care (Gallardo, Whitacre, and Grant 2018). It is important to note that broadband adoption, rather than availability alone, is the key driver in rural economic growth. However, broadband expansion to underserved citizens would still result in significant economic benefits even when combined with adoption rates lower than the national average (Rembert, Feng, and Partridge 2017).

For example, increased rates of per-capita economic activity seen in Lake County, FL compared to state peers were linked to the deployment of an extensive fiber-optic network by a municipal utility within the county (Ford and Koutsky 2005). Between 2002 and 2005, economic activity in Lake County grew at 0.52% per month, compared with 0.29% per month in comparable Florida counties. Gross retail sales, one of the most important indicators used by economists to estimate overall market

trends, served as a proxy to facilitate measurements of economic activity (Ford and Koutsky 2005). Lake County also experienced higher rates of population growth, which may be linked with municipal broadband implementation. However, statistical analyses showed that even if all population growth is conservatively assumed to be unrelated to municipal broadband, Lake County's increased economic growth was not simply an effect of population changes (Ford and Koutsky 2005). Beyond the narrow measure of retail activity, municipal networks foster broader social equity and economic opportunity. Counties that gain access to broadband enjoy an average 1.8% increase in overall employment, with even larger gains seen in rural areas (Atasoy 2013). The Chanute, KS network generates over $600,000 in revenue each year to support municipal operations (Porter 2013).

Chattanooga's high-speed network is an exemplary case study for the ways in which municipal 'power and light' utilities can empower and enlighten communities by expanding their service portfolio to include broadband Internet. Cloud-computing companies such as Claris Networks, as well as telecommunications-intensive firms such as HomeServe and Bellhops, use the system as a cost-effective backbone for their local technical infrastructure (Lobo 2015). In 2008, economists projected that the system would create $352.4 million in elevated economic activity and 2,600 new jobs by 2015 if deployed throughout Hamilton County, which includes Chattanooga (Lobo, Novobilski and Ghosh 2008). Since its network became operational in 2010, the former struggling textile town has in fact welcomed $1.3 billion in new investment and 6,800 new jobs (Remy 2013). Productivity gains as a result of the network's extraordinary capacity have saved local firms approximately $2,300 per commercial customer per year (Lobo 2015).

0.4 - Creating Grassroots Internet Innovation

Although beneficial for a given community, creating a municipal broadband network is not, in technology parlance, a simple 'plug-and-play' operation. A 2015 White House report shows that many U.S. states, including Kansas, have fewer than 10 municipal broadband networks (2015a). Chattanooga, TN only constructed its infrastructure after receiving a $111 million federal grant and issuing $170 million worth of municipal bonds (Rushe 2014). The risk paid off: as of July 2016, the network had twice as many subscribers as are needed to break even, and has become the largest single taxpayer in the city (Koebler 2016).

Chanute was able to avoid taking on debt by constructing its network through an incremental process funded by electric utility revenue, connection fees from local institutions, and a limited number of small grants (Gonzalez and Mitchell 2012). The initial buildout of Chanute's network was motivated by a Department of Homeland Security requirement for improved security measures, such as networked closed-circuit cameras, at public water supply systems. In 2015, Chanute considered adding an

extensive fiber-to-the-home (FTTH) component to its system, and even obtained approval to do so from the Kansas Corporation Commission despite significant opposition from AT&T. However, this plan was postponed indefinitely due to the $19 million debt that would be required (Gonzalez 2015). Municipal utilities are advanced technological projects, but they depend upon adequate funding and enlightened leadership as much as light-speed fiber optic cables.

Political and entrepreneurial factors drive local Internet innovation, but can also present barriers and disincentives. For instance, advances in the municipal water utility sector are hampered by "institutional constraints" and "inertia in the … industry" (Kiparsky et al. 2013, 395). New innovations often diffuse more slowly among publicly-owned utilities than their larger corporate counterparts (Rose and Joskow 1988). Researchers have documented a trend in which "state or federal (utility) regulation … might manifest itself in very different ways depending on the institutional structures that shape the local politics" (Teodoro 2010, 101). Barriers to utility innovation are often made more severe by "institutional resistance to externally-generated information" (Rayner, Lach and Ingram 2005, 223). Governance structures are often imperfectly organized, and can lack vantage points from which to acquire new information and consider new perspectives (Kitchin and Dodge 2011).

0.5 - Building Upon Local Capacities

The perspective of municipal administrators provides insight into the local political and managerial factors that foster or inhibit Internet innovation. In addition to state and federal politics, data suggest that local management practices are a key determinant for whether or not a given municipality operates a broadband network. By making decisions regarding network technologies and policies, these leaders serve as crucial links between the individual user scale and the global network scale. Elazar noted that the political culture of the Midwest was characterized by both an antipathy toward state and federal government expansion, as well as a "willingness to use local governments to foster communalism" (Elazar 1980, 24). Many 'Great Plains' citizens view the development of public utilities as an especially legitimate use of government authority (Elazar 1980). Municipal governments command higher levels of citizen trust compared to their national counterparts, as such governments can relate both to transnational capital flows and the interests of local citizens (Castells 2004). In the perspective of Silicon Valley activist Sonja Trauss, "'Even in this modern era of … the Internet and people … interacting in a place that's no place at all, City Hall is still a center'" (Dougherty 2016). Darden Rice, chair of the City of St. Petersburg, FL's Sustainability Committee, describes local innovation in the post-welfare-state era using the metaphor "'There is no [federal] cavalry left. We are the cavalry. It's up to [municipalities] to be the agents of change … in a practical way'" (Geiling 2016).

1 - Methods

1.1 - Survey Development

The research questions focus on the experiences, perceptions, and actions of municipal leaders in Kansas. The form of scale which describes governance institutions, such as municipalities or nations, is known as administrative scale, while the form of scale that defines the extent of a study area is known as observational scale (O'Lear 2010). The project recognizes the limitations of its limited sample size on the scope of its conclusions by focusing on the local political and social structures within the single U.S. state of Kansas. Administrative scale can be a useful starting point for understanding human activity, especially relationships between particular actors guided by particular sets of values and goals (O'Lear 2010). For instance, Guthrie and Dutton's analysis of public information utility development during the early 1990s focused exclusively on case studies within the state of California (Guthrie and Dutton 1992).

Kansas exemplifies rurality in many ways within the American geographic imagination. Its population density is just 35.6 persons per square mile (Hurd, Mercer, and Wedel 2016). For decades, Kansas license plates declared the slogan 'Midway, U.S.A,' as the geographic center of the contiguous United States is located in northern Kansas. As of 2013, 24.6% of Kansans lacked Internet access (Hurd et al. 2016) While many choose not to subscribe to Internet services, Internet accessibility is shaped by broader social and economic factors beyond mere individual choice. For instance, 5.4% of Kansans are not served by any wireline Internet providers, and 13.4% are only served by one wireline ISP (Fed. Communications Comm. 2014). A majority of Kansans (52.0%) can only choose between two available ISPs (FCC 2014) While 36.9% of Americans overall are served by three Internet providers, only 11.4% of Kansas have this number of competing choices available in their communities. Only 19.9% of Kansans have access to fiber optic infrastructure (FCC 2014).

Kansas network performance reflects these technological and economic limitations. The median download speeds for homes and businesses in Kansas are both less than five Mbps, and the median upload speeds are both less than 3 Mbps (FCC 2014). 25% of schools, libraries, and community centers access the Internet at download and upload speeds of less than 5 Mbps. Wireless technology is the only type of Internet infrastructure accessible to 100% of Kansans, but the median download and upload speeds for mobile Internet connections are 1.2 Mbps and 0.6 Mbps, respectively (FCC 2014).

The primary dataset derives from a survey, conducted in 2016, of municipal officials in 220 communities across Kansas and other states. Secondary data was obtained from the U.S. Census Bureau. Surveys are an effective means of gathering data from a diverse array of municipal leaders (Opp and Saunders 2013). The contact

method consisted of a two-stage process involving telephone and email outreach. The survey was hosted on an online platform and distributed through email addresses of randomly-selected municipal officials listed in the League of Kansas Municipalities directory. Approximately two months after the initial email query, telephone outreach was used to remind officials of the opportunity to respond. Officials who provided useful information included information technology directors, city managers, city planners, and city clerks. Ultimately, 38 communities provided responses via the emailed survey, resulting in an overall response rate of 17.3%. Communities with MBNs completed a version of the survey that included both more questions and more detailed questions than the version completed by non-MBN communities. This level of detail provides context that helps offset the limited breadth of the sample size by creating a more in-depth study of each responding community.

Chi-square and analysis-of-variance (ANOVA), as well as comparison of mean and median values, comprise the key statistical processing methods. These are optimal for the categorial, “Likert [Scale]-Type” data provided by respondents (Boone Jr. and Boone 2012). The threshold of statistical significance was set at a p-value of 0.2. This indicates that the likelihood of a given result occurring by random chance is 20% or less (Bennett, Briggs and Triola 2014). 0.05 is generally considered the conventional level of significance (Nuzzo 2014). However, significance thresholds are subjective guidelines that exist within a project-specific context (Nuzzo 2014). The 20% threshold was selected in accordance with the difficulty of obtaining a large number of responses from busy municipal officials, and to acknowledge the uncertainty associated with extrapolating generalized conclusions from a limited sample size.

1.2 - Community Characteristics

U.S. Census Bureau secondary data helped summarize the characteristics of responding communities. Their median population is 2,688 (Table 1). This signifies that the survey was effective at focusing on rural communities. The U.S. Census Bureau classifies a community as “rural” if it does not fall within an urbanized cluster; an urbanized cluster requires a population of at least 2,500 (2015c). Exactly half of the responding communities had 2015 population levels below this threshold. The average five-year population growth rate of responding communities was -0.29. This may indicate that responding communities are disadvantaged due to their failure to retain residents. Responding communities have a median home value of $84,800. This low value indicates a limited base from which to draw property tax revenue.

Table 1: Community Characteristics (U.S. Census Bureau)

Variable	N	Median	Min	25th Percentile	75th Percentile	Max	Median (State of KS)
2015 Population Estimate	38	2,688.0	103	761.8	7231.5	389,965	2,911,641.0
2010 Population	38	2,830.5	111	750.8	7412.8	382,368	2,853,118.0
5-Year Population Growth (%)	38	-0.2%	-7.2%	-4.1%	3.2%	8.6%	2.1%
2014 Median Household Income ($)	38	$41,607.5	$27,232	$36382.8	$50,775.8	$81,622	$51,872.0
2014 Poverty Rate (%)	38	14.0%	2.9%	8.3%	23.5%	37.3	13.0%
2014 Median Housing Value ($)	38	$84,800.0	$29,000	$53,425.0	$134,400.0	177,900	$129,400.0
2014 High school graduate or higher (%)	38	90.4%	77.3%	87.0%	93.1%	98.6%	90.0%
2014 People of Color (%)	38	8.9%	1%	5.3%	14.2%	44.3%	21.8%
2014 Median Age	38	37.25	21	33.3	41.6	56.1	36.0

All of the responding communities are located in Kansas. Two operate municipal broadband networks (MBNs), while 36 do not. The population growth rate, median household income, median housing value, and rate of educational attainment of the sample of responding communities were all lower than those of the state of Kansas as a whole. The poverty rate of the responding communities is higher than that of the state of Kansas as a whole. 35 of the responding communities receive electric power service from an investor-owned or cooperative utility, while three receive electric power from a

municipal utility. One of the communities with an MBN operates a municipal electric utility, while the other receives electric service from an investor-owned corporation.

2 - Internet Insights: Lessons Learned from Data Analysis

2.1 - Professional Knowledge Base

One key research question is 'How do municipal managers learn about municipal broadband?' Many responding communities are located far from population centers, and have limited funding for professional development. Therefore, an initial hypothesis was that popular media would be the most common means by which staff members learned about MBNs. However, "Professional Conferences" were in fact the most common venue for education. 42% of respondents selected this as one of their choices. Professional conferences are not just the most common source of knowledge; they are likely the most effective. A statistical correlation exists between the likelihood of learning about MBNs at "professional conferences" and the likelihood of planning to implement one in the near term. None of the other knowledge sources was statistically associated with MBN implementation likelihood. This indicates that an important synergy exists between both tacit and explicit knowledge, as both are more readily available through professional conferences than through non-interactive media.

Table 2: Relationship Between "Professional Conferences" as Knowledge Source and Implementation Plans

Pearson Chi-Square 2-Sided Asymptotic Significance: **0.166**		Q18 - Which best describes your community's plans for creating [an MBN]?			Total
		No Plans to Implement	Considering Implementation Indefinitely	Likely to Implement Within the Next Five Years	
Q1 - Where have you learned about [MBNs]?	Answer Choice "Professional Conferences" Not Selected	17	2	0	19
	Answer Choice "Professional Conferences" Selected	10	3	2	15
Total		27	5	2	34

Many leaders are motivated to further develop their knowledge and skills. 68.4% of respondents provided feedback regarding what municipal-broadband-related topics they would be most interested in learning more about. An overwhelming plurality provided responses indicating that they would be most interested in learning about best management practices for operating MBNs. The second-most-frequently-mentioned topic was cost and financial concerns. Words related to this topic comprised a 20% plurality of results in the text frequency analysis. Potential benefits from MBNs, as well as legal implications, also were a popular topic of interest. Many responses indicated that managers perceive small population size as an obstacle to municipal broadband implementation. For instance, one leader reported that they "live in a small community, and would love to see if it was cost effective on a small scale."

Topics related to MBN operations were prominent in reports of desired future knowledge. A plurality of operations-related topics of desired future knowledge corresponded to basic and abstract concepts. For instance, the phrase "How they work and what is the best plan for the city to consider" epitomizes this category. Many such responses only included one word. This pattern underscores the many competing demands for the time of municipal managers. It also highlights the importance of addressing basic MBN implementation topics at professional conferences and other knowledge sources. 18% of the operations-related topics reported as subjects of further interest involved whether or not an MBN would be feasible in the respondent's particular local context. In fact, local context was the second-most-commonly reported desired future topic of knowledge regarding MBN operations. This is likely an important topic for education and outreach efforts, as MBNs have achieved successful results in communities of limited population size, in addition to large cities. It is important to address MBN misconceptions, such as the idea that small towns lack the capacity to create MBNs, through professional development sources.

2.2 - Retrospective Results

Some leaders have learned about municipal broadband firsthand by creating systems in their communities. The perspectives of these leaders provide an important benchmark. Both respondents claimed that they developed their systems incrementally over a period of several years. Reports of cost were similarly indeterminate; one estimate ranged between "$4-5 million," while another respondent reported "not to have a running total." These finding suggest that MBN planners should prepare for considerable levels of uncertainty. One manager, who had implemented an MBN for internal municipal government use, reported that the "actual installing of conduit and fiber in the ground is the major expense … about $13.00 per foot for conduit, fiber, hand-holes, splice enclosures, and labor." My initial hypothesis was that broadband-specific technical needs, such as server farm maintenance, would present the greatest operations expense. However, the manager reported that "Personnel costs to manage

the right-of-way inspections … and locate requests" presented the most significant O&M expense.

The motivating factors for municipal broadband implementation strongly support those highlighted in the literature. One respondent claimed that the factor which most strongly influenced their community's decision to implement such a network was "[municipal] Electric utility," while another reported that it was "The inadequate options we had connecting…buildings at…locations." Both the literature and statistical analysis support the wide applicability of the former response (Walton 2014). Chi-Square testing shows that a significant positive correlation exists between the presence of an MBN and the presence of a municipal electric utility. This result is a noteworthy case in which professional literature, qualitative findings, and quantitative findings all support the hypothesis that such a correlation exists.

Table 3: Relationship Between Presence of Municipal Electric Utility and Presence of Municipal Broadband Utility

Pearson Chi-Square 2-Sided Asymptotic Significance: **0.028**		Q3 - Does your municipality own and operate a municipal broadband network?		
		Yes	No	Total
Muni_Electric (Does community own and operate a municipal electric utility?)	No	1	32	33
	Yes	1	2	3
Total		2	34	36

In addition to "Lack of Familiarity Among Citizens," one of the greatest reported challenges to creating a community network was "Lack of financial and personnel resources." While the singular response to this data point limits its applicability, it is still noteworthy due to its close alignment with the most frequently reported perceived challenge factor among communities without an MBN. Even leaders who have not already implemented a network of their own can still have an accurate understanding of the challenges involved. For instance, a manager reported that "we have the same number of employees [in the IT departments] as we did in 2007," and that it would be difficult to establish an MBN for public use when resources were already so strained by the demands of supporting municipal use. This manager had performed "much of the work" on fiber development network on personal time outside of office hours.

Although the barriers to creating an MBN can be daunting, the rewards can be significant. Both respondents from communities with MBNs agreed that the greatest

benefit from their networks is “Improved Communication Among City Staff.” This function could benefit residents by improving the response time for city service provision and reducing associated costs. The manager’s responses differed regarding other benefits. “Reliability” and “Improving Adoption Rates Among Community Members,” respectively, were the reported aspects of their systems that most exceeded performance expectations. This indicates that MBNs help address both technocratic and social-justice-oriented concerns. However, both respondents reported that the aspect of their networks which most failed to meet expectations were “Effectiveness at Closing ‘Digital Divides.’”

This suggests that the benefits of MBN implementation may diffuse unevenly within communities. For instance, one MBN aspect reported as most matching expectations was “Success at Promoting Economic Development.” However, “Success at Closing Digital Divides” was not reported by any respondents. The only other aspect reported as most matching expectations was “Speed.” This response is intended to measure data transfer speed, rather than the speed at which the system was constructed. This highly quantifiable factor often features prominently in marketing materials for broadband services, and likely plays a crucial role in perceptions of MBNs among both municipal leaders and the lay public.

Mentorship from an experienced practitioner can be an effective learning strategy. Leaders in municipalities with MBNs provided recommendations for their counterparts in non-MBN communities through their responses. These responses emphasize the importance of sustained education and professional development, and reinforce the idea that local leadership is a critical factor in the development of socio-technical systems. One recommendation was “Collaborate with other anchor institutions, implement incrementally, join Next Century Cities, educate staff and management on options,” while the other was “Education (sic) leaders on benefits of a fiber network.” Even in high-technology sectors, the venerable techniques of collaboration and apprenticeship remain crucial to advancement.

2.3 - ‘Push’ and ‘Pull’ Factors

Another key focus was an identification of the incentives and disincentives experienced by leaders as part of the decision-making process regarding municipal broadband. Just as ‘push’ and ‘pull’ factors impact citizens’ decisions to migrate across space, similar networks of influences shape leaders’ decisions to migrate from private to public broadband utility systems. These include endogenous, exogenous, qualitative, and quantitative factors. Many of the results were surprising, but others match patterns previously highlighted by literature, media outlets, and case studies. Due to the complexity of MBN implementation and operation, the project’s initial hypothesis was that a variety of themes, including those based in social and political conditions, would

guide MBN decision-making. However, such decision-making appears to be based strongly in financial and entrepreneurial factors.

2.3.1 - Perceived Incentives

Many popular media outlets have covered municipal broadband favorably (Koebler 2016). This resulted in an expectation that many municipal leaders interested in MBNs gained motivation from the opportunity to put their communities in the national spotlight. However, the benefit from municipal broadband anticipated by the greatest proportion of respondents was “Accelerated Economic Development” rather than “Improved Community Publicity/’Buzz.’” This indicates a crucial role for pragmatic and quantifiable benefits.

Table 4: Relationship Between Perceived MBN Incentives and Implementation Plans

Pearson Chi-Square 2-Sided Asymptotic Significance: **0.463**		Q18 - Which best describes your community’s plans for creating [an MBN]?			
		No Plans to Implement	Considering Implementation Indefinitely	Likely to Implement Within the Next Five Years	Total
Q5 - Which factor do you anticipate would be the greatest benefit of [an MBN]?	Accelerated Economic Development	6	2	2	10
	Greater Broadband Adoption	2	2	0	4
	Improved Broadband Speed	5	0	0	5
	Improved Communication Among City Staff	3	0	0	3
	Improved Community Publicity/"Buzz"	3	0	0	3
	Reduced Broadband Cost	7	1	0	8
	Other	1	0	0	1
Total		27	5	2	34

Level of community demand was not associated with perceived incentives. This suggests that mangers are receptive to community demand when choosing whether to implement an MBN, but also that their professional knowledge is a more significant factor in perceptions of MBNs than the perspective of citizens. Together, these patterns suggest that knowledge gained from professional development sources overall plays a key role in shaping MBN perceptions. Better and more complete data could help foster

a higher quality and more holistic decision-making process. For instance, it is important for municipal leaders to engage community members in learning about the benefits of broadband adoption, as adoption, rather than access alone, is required for the benefits of improved internet connectivity to be fully realized by a community.

Alternatively, a significant variance occurs between perceptions of MBN benefits when the analysis incorporates the community revenue indicators of housing value and median income. Therefore, existing community conditions may indeed influence MBN perceptions, as leaders seek to identify remedies for economic development challenges or perceived stigmatization. Managers who focus on raising incomes within their community may foreground the economic development benefits of MBNs, while managers in more affluent communities may be interested in other priorities. For instance, the average median household income among respondents who reported that the greatest benefit of an MBN would be "Improved Communication Among City Staff" is over $10,000 higher than that among respondents who reported that the greatest MBN benefit would be "Improved Community Publicity/'Buzz.'"

Furthermore, the only data element with significant variance between the categories of MBN planning was the poverty rate. Statistical analysis shows a positive correlation between likelihood to implement an MBN within the next five years and the poverty rate. This result likely stems from the prominent role of economic development benefits in perceptions of MBN benefits. For instance, Next Century Cities, a municipal-government-backed advocacy group that publishes educational materials regarding telecommunications for public officials, lists "new opportunities for small businesses, to higher property values, to a stronger local economy" as three of the four key benefits of improved broadband infrastructure in its Policy Agenda (NCC 2015, 2). Internet connectivity is not a panacea for poverty. However, communities with more severe and immediate poverty challenges may be more motivated to attempt alternative economic development solutions, such as MBNs, than communities who are relatively secure in their affluence.

This link between poverty and implementation likelihood may seem counterintuitive, as communities with reduced levels of financial capital may have fewer resources to invest in broadband infrastructure. However, such communities, if sufficiently motivated and organized, can obtain capital from federal grant programs. Research suggests that social capital and collective problem-solving ability, known as entrepreneurial social infrastructure, plays a greater role than financial capital alone in fostering rural economic development (Flora et al. 1997). For instance, the level of federal financial capital available for innovation and development in the rural U.S. south is not limited by poverty levels in a given locality (Hall and Howell-Moroney 2012). One supporting data point is the lack of significant variation in community revenue proxies between respondents who reported each perceived disincentive as most significant.

Communities with lower property values would seemingly view financial factors as more significant MBN obstacles than their more affluent counterparts. However, no such difference exists.

Table 5: Relationship Between Community Demographics and MBN Implementation Plans

		Q18 - Which best describes your community's plans for creating a municipal broadband network?			
Variable	ANOVA Significance Level	No Plans to Implement Mean	Considering Implementation Indefinitely Mean	Likely to Implement Within the Next Year Mean	Likely to Implement Within the Next Five Years Mean
Population (2015)	0.908	19,868.0	5,856.0	.	11,125.5
Population (2010)	0.906	19,517.0	5,644.8	.	11,080.0
5-Year Population Growth Rate	0.739	-0.2%	1.0%	.	-1.8%
Median Household Income (2014)	0.432	$45,952.2	$49,657.2	.	$35,471.0
Poverty Rate (2014)	0.122	14.9%	13.5%	.	27.5%
Median Home Value (2014)	0.288	$88,227.0	$118,880.0	.	$78,800.0
H.S. Graduation Rate (2014)	0.663	89.5%	89.9%	.	85.9%
% of Population People of Color (2014)	0.913	11.1%	9.1%	.	10.9%

An important MBN benefit identified in literature is "Improved Communication Among City Staff" (Kelley 2004). This appeared be an important motivating factor, as many communities with broadband networks accessible to citizens initially created their networks to facilitate communication among municipal employees. However, "Improved Communication Among City Staff" was only cited by 8.8% of respondents. This suggests that leaders primarily consider the needs of citizens, rather than municipal staff, when making planning decisions. It could also indicate that communications-intensive innovations such as 'smart' electrical grids and automated meter reading systems diffuse relatively slowly and unevenly. This result raises a noteworthy

disjuncture, as communities with MBNs unanimously reported that “Improved Communications Among City Staff” was in fact the greatest benefit of their systems. This paradox indicates an opportunity for educating municipal mangers regarding the benefits for interdepartmental communication offered by MBNs.

Another opportunity for education lies in the area of community demand. A plurality of respondents indicated that the level of demand for an MBN among citizens in their community was “None.” Furthermore, an outright majority reported that the level of demand was either “A Little” or “None.” Outreach efforts to citizens and community organizers could increase levels of grassroots demand for MBNs. However, the bimodality of results for the questions regarding community demand does indicate optimism for MBN prospects. More than one in ten respondents reported that “a great deal” of demand exists for an MBN. Tacit knowledge from members of communities that already have implemented MBNs could motivate favorable perceptions in their non-MBN counterparts. Additionally, citizens who support MBNs could have gained knowledge from popular media outlets, which have highlighted the successful systems in places such as Chattanooga.

Statistical comparison between the level of reported community demand from a municipal broadband network and reported implementation plans show that the likelihood of planned implementation increases in lockstep with perceived demand. A statistically significant positive association also exists between population size and likelihood of planned implementation. This indicates that municipal leaders are responsive to the desires of their constituents. It also indicates that large communities, rather than rural ones, may be more likely to implement MBNs. Such communities, which benefit from economies of scale, likely have greater reserves of both human capital and financial capital for investment in an MBN project. A statistically significant positive association exists between population size and stated level of demand among citizens. The mean population of communities that reported “A Great Deal” of demand is over 100,000, while the mean population of communities that reported “A Little” demand is less than 15,000. Literature supports this finding, as the prominent case study of Chattanooga represents a metropolitan area (Lobo et al. 2008). Education initiatives could help citizens of rural communities learn more about the benefits of MBNs.

Table 6: Relationship Between Perceived Community Demand and MBN Implementation Plans

Pearson Chi-Square 2-Sided Asymptotic Significance: **0.004**		Q18 - Which best describes your community's plans for creating [an MBN]?			
		No Plans to Implement	Considering Implementation Indefinitely	Likely to Implement Within the Next Five Years	Total
Q17 - How much demand currently exists among members of your community for [an MBN]?	A great deal	2	1	1	4
	A lot	0	0	1	1
	A moderate amount	6	2	0	8
	A little	6	1	0	7
	None	13	1	0	14
Total		27	5	2	34

2.3.2 - Perceived Disincentives

Due to the often-slow pace of technological innovation and diffusion among municipal utility institutions, "Lack of Familiarity Among Staff" was anticipated to pose a major disincentive. In fact, "Cost of Equipment/Right-of-Way" was the most frequently cited disincentive. This result is not surprising, given that secondary data shows disproportionately low levels of economic development among responding communities. Historic disinvestment in infrastructure and the resulting multitude of competing priorities exacerbate funding shortages.

Additionally, statistical analysis shows a significant inverse correlation between the perception of cost as the most significant barrier to MBN implementation and the likelihood of stated plans to create one. No correlation exists between perceived benefits and implementation plans. Level of community demand was not associated with perceived disincentives. This suggests that other projected benefits provide a counterweight to the primacy of economic development. Alternatively, many of the communities that perceive that economic development is the most significant perceived benefit may not have a high level of confidence in the ability of an MBN to deliver any benefits. They may choose to allocate scare funds to other priorities, which they believe have a greater likelihood of producing economic development benefits or improving overall quality of city services. The only secondary data point with a statistically significant association to perceived disincentives was proportion of the population comprised of persons of color. More diverse communities were less likely to cite 'Lack

of Familiarity Among Staff' as a disincentive. Higher levels of diversity may indicate communities that are larger, and thus have more resources available to municipal personnel. Population size alone nearly meets the threshold of statistical significance for association with chosen perceived disincentive.

Table 7: Relationship Between Perceived MBN Disincentives and Implementation Plans

Pearson Chi-Square 2-Sided Asymptotic Significance: **.017**		Q18 - Which best describes your community's plans for creating [an MBN]?			
		No Plans to Implement	Considering Implementation Indefinitely	Likely to Implement Within the Next Five Years	Total
Q16 - Which factor do you anticipate would present the greatest challenge to implementing [an MBN]?	Cost of Equipment/Right-of-Way	16	5	0	21
	Lack of Familiarity Among Staff	2	0	0	2
	State Restrictions	3	0	2	5
	Other	6	0	0	6
Total		27	5	2	34

A minority of managers chose "State Restrictions" as the most significant perceived barrier. Statistical analysis supports the concept that state restrictions are a relatively weak disincentive. A positive association exists between perceptions of them as the most significant perceived barrier and likelihood of planned near-term MBN implementation. The defeat of a municipal broadband restriction bill in the Kansas State Senate in 2014 could explain this trend. Managers may believe that a similar bill is unlikely for proposal in the near term. This pattern supports the concept that cost is the most significant barrier to MBN implementation.

A conclusion regarding this result follows the operational research themes originally developed by British military statistician Abraham Wald. He realized that patterns of concentrated damage on aircraft returning from battle showed not locations in need of additional armor, as was originally theorized, but locations where armor was unnecessary. The optimal location for additional armor was in fact areas where no damage was present, as aircraft with damage in these areas did not survive to return for observation (Mangel and Samaniego 1984). Similarly, communities with surviving MBN implementation plans tend to cite state restrictions as the greatest obstacle, while communities with no such plans tend to cite cost as the greatest obstacle. The

conclusion results that cost is the more significant obstacle, as it is associated with a lack of MBN implementation plans.

Ultimately, over three-quarters of responding communities reported that they have no plans to implement an MBN. Only five percent of responding communities reported that they plan to implement one within the relatively immediate time scale of five years. No responding communities reported planned MBN implementation within the scale of one year. This pattern indicates that the disincentives to MBN implementation currently outweigh the incentives in the minds of most municipal leaders. It underscores the multifaceted definitions of the 'digital divide' concept. A 'digital divide' occurs between the successful results of MBN projects, and the perception of MBNs among Kansas municipal leaders. From Chanute to Chattanooga, MBNs have made tangible progress at energizing community development. However, few Kansas managers appear to be sufficiently aware of or motivated by the results of these case studies to implement MBNs in their own communities. Additionally, a similar divide occurs between the level of financial resources necessary to create an MBN and the financial resources available to most rural municipal governments.

2.4 - Leading Indicators of Broadband Leadership

Due to the limited sample size of communities with MBNs, this research investigates unique trends among communities that have already implemented operational MBNs, as well as among communities that reported plans to implement an MBN within the next five years. Median housing value initially seemed correlated with the presence of MBNs, as municipalities with higher levels of property tax revenue would have more resources to offset the cost. ANOVA does not support this hypothesis; no significant variance in median housing value exists between communities with an MBN and those without.

Demographic factors, such as income, education, and race, impact individual rates of internet adoption (Perrin and Duggan 2015). However, no significant variation in median household income exists between communities with and without MBNs. The small sample size of the former could influence this result. However, it suggests a promising pattern in which low levels of income and revenue do not preclude MBN implementation. Additionally, no significant variation exists in educational attainment rates between communities that reported high levels of demand for MBNs and those who reported low levels. This suggests that interest in MBNs is not limited to those with higher education, and that even community members with relatively low levels of education perceive benefits of MBNs. Equitable interest in municipal broadband suggests the potential for high rates of adoption.

Broadband innovation may be an equitable path to greater prosperity for core and disadvantaged communities alike. It can even help turn the latter into the former.

The only statistically significant variation observed between communities with MBNs and those without was population growth rate. Growth rate is positively associated with MBN presence. While statistical analyses do not explicitly define the direction of causality, findings from case studies described in the literature suggest that MBNs can help communities recruit and retain satisfied citizens (Ford and Koutsky 2005). Alternatively, communities with higher growth rates may be more likely to construct major infrastructure projects, such as extending utility service to growth boundaries.

Table 8: Relationship Between Community Demographics and MBN Presence

		Q3 - Does your municipality own and operate a municipal broadband network?	
	ANOVA	Yes	No
Variable	Significance Level	Mean	Mean
Population (2015)	0.482	51,584.5	17,293.2
Population (2010)	0.511	48,381.0	16,980.7
5-Year Population Growth Rate	0.170	4.3%	-0.1%
Median Household Income (2014)	0.857	$44,202.5	$45,880.5
Poverty Rate (2014)	0.464	20.1%	15.4%
Median Home Value (2014)	0.349	$121,850.0	$92,180.2
H.S. Graduation Rate (2014)	0.401	92.7%	89.3%
% of Population People of Color (2014)	0.339	17.3%	10.8%

Implementing an MBN simultaneously with other capital projects can help lower the barrier to entry. Literature identifies the presence of a municipal electric utility as another key factor that lowers the barrier to entry for broadband innovation (Bar and Park 2006). A statistically significant correlation exists between the presence of a municipal electric utility and an MBN, confirming this pattern.

3 – Conclusions and Recommendations

This paper's main research question is 'What incentives and disincentives impact municipal leaders as they make decisions regarding municipal broadband?' Its results provide insights into processes by which incentives could be capitalized upon and disincentives could be overcome, thus promoting MBN implementation at the individual,

community, and state/national scales. Initiatives that bridge these levels of leadership could create a cohesive force for guiding the socio-technical system of broadband Internet infrastructure in a more sustainable direction.

The results, while limited by small sample size, provide insights regarding the existing landscape of MBN development, as well as future trends in which forward-thinking leaders could alter this landscape. MBNs, perceived as systems owned by a municipality that provide broadband access in a manner analogous to a public utility, are relatively uncommon in Kansas. They are most common in rapidly growing communities, as well as those that already operate a municipal electric utility. However, many municipal leaders already possess knowledge regarding MBNs gained through professional conferences and job training. They are most interested in learning about tactics for effective operations, especially within a holistic local context.

MBNs are costly to construct in terms of both time and money. Cost is the most significant perceived disincentive for MBN implementation. Municipal leaders are most likely to report near-term implementation plans in large communities and in those with a high poverty rate. Community demand is associated with planned implementation likelihood, but such demand is relatively low in Kansas. This low level of demand may be associated with the agriculture-based economy in much of the state. Economic development is the most significant perceived incentive for MBN implementation. This matches conclusions from writers such as Graham and Marvin, who note that “the development of advanced systems … has been targeted by localities attempting to capture firm investment” (Graham and Marvin 1996). Communities with MBNs report that the most important benefit of their systems is improved communications among city staff, but that MBNs underperform expectation with respect to closing the ‘digital divide.’ These results suggest that managerial entrepreneurialism informs municipal leaders’ responses to perceptions of MBN implementation ‘push’ and ‘pull’ factors (Harvey 1989).

3.4 - Future Developments

The chief obstacle to gathering data regarding MBN implementation is the sheer lack of existing MBNs. However, as more communities implement such networks, more tacit knowledge will become available. Each manager who implements an MBN will be able to share lessons learned from his/her experiences with other mangers, further reducing barriers to entry. Another positive feedback loop that could help promote MBN implementation is cost efficiency. MBNs are successful at improving communication among municipal personnel; this could lead to cost savings from improved productivity, which in turn could free up additional funding for MBN expansion and capacity building. These positive feedback loops bode well for the future of municipal broadband, even as political changes will likely lead to reduced interest in net neutrality and universal service considerations within the Federal Communications Commission.

The FCC's role highlights important issues of geographic and administrative scale involved in municipal broadband. Federal government institutions overall have suffered declines in public trust during recent years of political hyper-polarization. Steve Goldsmith, a professor at Harvard's Kennedy School of Government, notes that "72 percent of Americans said that they trusted their local governments a "great deal" or a "fair amount," even though the trust level for government in general fell to a meager 24 percent" (Goldsmith 2015). By transferring information across vast distances at the speed of light, broadband networks catalyze spatiotemporal compression to an unprecedented degree. However, despite their extraordinary international spatial scale, such networks grow upon efforts and investments made at the local level. As SCOT theory emphasizes, even the most advanced information systems cannot diffuse equitably through diverse societies without active guidance from social and political networks. The Next Century Cities Policy Agenda explains that "Some of the best places in the United States to get Internet access are [those] where local governments directly provide the service" (NCC 2015, 6). In the years to come, municipal governments that pursue broadband innovation are likely to take center stage as Americans' gateway to the global space of information flows.

Martin Koch graduated with a master's in geography from the University of Kansas in 2017. The views expressed in this article are his own; they have not been reviewed or approved by the State of Kansas.

Appendix A - Survey Text

‘Digital Utilities’ Municipal Broadband Innovation Survey

Q1 Where have you learned about municipal broadband networks?
- ❑ Job Training (1)
- ❑ Popular Media (2)
- ❑ Professional Conferences (3)
- ❑ Professional Media (4)
- ❑ This Survey (5)
- ❑ Other (6) _____

Q2 What would you be most interested in learning about municipal networks?

Q3 Does your municipality own and operate a municipal broadband network?
- ❍ Yes (1)
- ❍ No (2)

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q6 How long did your municipality's network take to plan and build in total months?

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q7 How much did your municipality's network cost in total dollars?

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q8 Which factor most strongly influenced your municipality's decision to implement a municipal broadband network?
- ❍ Availability of Existing Infrastructure (i.e. Municipal Employee Intranet) (1)
- ❍ Availability of Federal, State, or Other Grants (2)
- ❍ Demand From Citizens (3)
- ❍ Economic Development Opportunities (4)
- ❍ Other (5) _____

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q9 Which factor was the greatest challenge to creating your community's municipal broadband network?

- ❍ Cost of Equipment/Right-of-Way (1)
- ❍ Lack of Familiarity Among Citizens (2)
- ❍ Lack of Familiarity Among Staff (3)
- ❍ State Restrictions (4)
- ❍ Other (5) _____

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q10 Which factor is the most important benefit from your community's municipal broadband network?

- ❍ Accelerated Economic Development (1)
- ❍ Greater Broadband Adoption (2)
- ❍ Improved Broadband Access for Schools and Colleges (3)
- ❍ Improved Broadband Speed (4)
- ❍ Improved Communication Among City Staff (5)
- ❍ Improved Community Publicity/"Buzz" (6)
- ❍ Reduced Broadband Cost (7)
- ❍ Other (8) _____

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q11 For which factor(s) would you most describe your municipality's network as performing "Better than Expected"?

- ❍ Cost (1)
- ❍ Speed (2)
- ❍ Effectiveness at Closing 'Digital Divides' (3)
- ❍ Success at Improving Adoption Rates Among Community Members (4)
- ❍ Success at Promoting Economic Development (5)
- ❍ Reliability (6)

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q12 For which factor(s) would you most describe your municipality's network as performing "Worse than Expected"?

- ❍ Cost (1)
- ❍ Speed (2)
- ❍ Effectiveness at Closing 'Digital Divides' (3)
- ❍ Success at Improving Adoption Rates Among Community Members (4)
- ❍ Success at Promoting Economic Development (5)
- ❍ Reliability (6)

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q13 For which factor(s) would you most describe your municipality's network as "Meeting Expectations"?

- ❍ Cost (1)
- ❍ Speed (2)
- ❍ Effectiveness at Closing 'Digital Divides' (3)
- ❍ Success at Improving Adoption Rates Among Community Members (4)
- ❍ Success at Promoting Economic Development (5)
- ❍ Reliability (6)

Display This Question:
If Does your municipality own and operate a municipal broadband network? Yes Is Selected

Q14 What recommendations would you have for leaders who are considering implementing a broadband network?

Display This Question:
If Does your municipality own and operate a municipal broadband network? No Is Selected

Q5 Which factor do you anticipate would be the greatest benefit of a municipal broadband network?

- ❍ Accelerated Economic Development (1)
- ❍ Greater Broadband Adoption (2)
- ❍ Improved Broadband Access for Schools and Colleges (3)
- ❍ Improved Broadband Speed (4)
- ❍ Improved Communication Among City Staff (5)
- ❍ Improved Community Publicity/"Buzz" (6)
- ❍ Reduced Broadband Cost (7)
- ❍ Other (8) _____

Display This Question:
If Does your municipality own and operate a municipal broadband network? No Is Selected

Q16 Which factor do you anticipate would present the greatest challenge to implementing a municipal broadband network?

- ❍ Cost of Equipment/Right-of-Way (1)
- ❍ Lack of Familiarity Among Citizens (2)
- ❍ Lack of Familiarity Among Staff (3)
- ❍ State Restrictions (4)
- ❍ Other (5) _____

Display This Question:
If Does your municipality own and operate a municipal broadband network? No Is Selected

Q17 How much demand currently exists among members of your community for a municipal broadband network?

- ❍ A great deal (1)
- ❍ A lot (2)
- ❍ A moderate amount (3)
- ❍ A little (4)
- ❍ None (5)

Display This Question:
If Does your municipality own and operate a municipal broadband network? No Is Selected

Q18 Which best describes your community's plans for creating a municipal broadband network?

- ❍ No Plans to Implement (1)
- ❍ Considering Implementation Indefinitely (2)
- ❍ Likely to Implement Within the Next Year (3)
- ❍ Likely to Implement Within the Next Five Years (4)

Q19 How would you define "municipal broadband?"

Q19 What recommendations would you have for improving this survey?

Q20 What's your name and position title?

Q20 Would you like to participate in a telephone interview to share your expertise in greater detail? If so, please provide the best phone number to reach you at:

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