



Credit: City of Rochester Communications Bureau

# BRIDGING THE DIGITAL DIVIDE IN ROCHESTER, N.Y.

September 2019

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## Executive Summary

As the Rochester region's economy becomes even more firmly rooted in technology and innovation, citizens, public institutions and businesses will be more reliant on broadband internet. In wide sections of Rochester, however, many households are not online. While rural areas struggle to gain access to broadband infrastructure, urban areas face a different problem: adoption. Lagging subscription rates are due in part to affordability. The marketplace is dominated by only a few internet service providers who can set prices out of reach for low-income households. The importance of broadband means it should be treated like basic infrastructure. Monroe County owns an extensive fiber internet network that could be upgraded to allow other users, including other governments, residents and businesses. Rochester should join with Monroe County to create a municipal broadband network, which could adopt one of several models and technological approaches. The network would have to be governed by a new, cooperative entity. Creating a municipal network will require political and public support, financing, extensive planning and careful implementation. It would be important for leaders to also address issues associated with lack of digital readiness and equipment through education and outreach. A municipal network, properly planned and executed, could alleviate digital inequities and foster economic development.

## Introduction

Nearly one-third of households in the City of Rochester don't have broadband internet at home, whether it is because of affordability, lack of equipment or lack of education. This has major implications for these citizens and the community, as a high-speed connection is necessary to fully participate in the digital world, including economic, educational and civic activity. The private marketplace has demonstrated it will not bridge the digital divide. A Monroe County study of its fiber infrastructure -- that has never been made public -- greatly informed this paper. The study shows the county has built a robust fiber network -- but it is 80 percent unused.<sup>1</sup> The network, if upgraded to "carrier class," has enormous potential to serve the public. First, I will provide evidence of the scope of the digital divide in Rochester. Second, I will explain various options for bridging the gap. Third, I will discuss the challenges of implementing an alternative. Finally, I will talk about the role of leadership in policy change.

## Background and Context

Rochester, New York has a rich history innovation. An Erie Canal boomtown, it was known as the “Flour City” when it was incorporated in 1834 for its flour mills along the Genesee River’s roaring waterfalls. Rochester later became the “Flower City” for its extensive nursery and seed businesses. The industrial age brought large clothing and shoe manufacturers, of which only Hickey Freeman remains. Bausch and Lomb, Kodak and Xerox were founded in Rochester, known for generations as the “Big Three” that supported the community.

Rochester has faced enormous setbacks in recent years. The “Big Three” are shadows of their former selves, having shed tens of thousands of jobs from the 1980s through the 2000s that the metropolitan area only recently recovered. The region ranks among the slowest-growing economies in the country.<sup>ii</sup> Unemployment is low, but many people have opted out of the workforce, which has shrunk by nearly 60,000 people since its peak in 1998.<sup>iii</sup> The *Wall Street Journal* recently reported Rochester has the worst job market in the country.<sup>iv</sup>

Monroe County has experienced a high rate of domestic outmigration since 2010, losing a net 34,000 people. The population has remained relatively stable – unlike its Upstate neighbors that saw big declines -- because of new births and international immigration.<sup>v</sup> Today there are just under 749,000 residents of Monroe County and 209,000 residents of the City of Rochester.<sup>vi</sup>

To make matters worse, the City of Rochester struggles with tremendous inequality. The city’s population has shrunk by more than a third since 1950, thanks to suburban flight. Banks redlined city neighborhoods, leaving patterns of segregation and disinvestment that persist today.<sup>vii</sup> The city has one of the highest child poverty rates in the country, with more than half of children living in poverty.<sup>viii</sup> The Rochester City School District is the worst-performing in the state, with a four-year graduation rate below 55 percent.<sup>ix</sup> The unemployment rate is twice that of Monroe County – at 12 percent.<sup>x</sup> Jobs have migrated to the suburbs, making it difficult for residents who don’t have cars to access work.<sup>xi</sup> Brookings ranked the Rochester metro 94 out of 100 on making progress in closing the racial wealth gap.<sup>xii</sup>

There is good news. Rochester shows promise of continuing to be on the forefront of innovation. Rochester outperforms the country when it comes to research and development spending, patents obtained and STEM degrees per capita.<sup>xiii</sup> Rochester is also home to Rochester Institute of Technology and University of Rochester, now two of the area’s largest employers. The area has dozens of photonics and information technology companies. The federal government chose Rochester to be a hub for photonics development.<sup>xiv</sup> Computer and electronics and the tech sector were among the region’s top exported goods and services in 2017, with both industries seeing significant growth since 2012.<sup>xv</sup> Growth in technology sector jobs is tracking national growth, making it one of the area’s healthiest sectors.<sup>xvi</sup>

As Rochester charts its path forward, workers must be prepared to participate in the changing economy – one focused on knowledge and technical-based skills. Seventy-four percent of jobs require a medium to high level of digital skills, ranking Rochester 15<sup>th</sup> out of 100 metros on

digitization of jobs. Those jobs are considered higher-paying and more resilient to automation.<sup>xvii</sup> Workforce development programs are struggling to address the “middle skills gap.”<sup>xviii</sup>

Rochester’s future depends on technology, yet wide swaths of the community face roadblocks to entering the information superhighway. The region is divided into haves and have nots when it comes to basic technology – the internet. Tens of thousands of Rochesterians do not have broadband internet at home. This vital technological amenity is necessary to fully participate in economic, educational, recreational and commercial activity. These citizens will continue to be left behind and the region may not fully realize its full potential.

This project will examine ways to bring Rochester up to speed – literally. Can Rochester build upon its legacy of innovation to bridge the digital divide?

### Clarification of Role

I will likely be joining the Monroe County Legislature in the coming weeks, as I won the Democratic primary in June in a heavily Democratic district. I have included exploring the use of Monroe County’s dark fiber network in my political platform. I will use this project to advocate for policy solutions to bridging the digital divide.

## Framing the Problem

A broadband internet connection allows people to take full advantage of access to services related to health care, education, employment, recreation and social activities.

The Federal Communications Commission defines broadband as 25 download and 3 Mbps upload. (Mbps means megabits per second, the speed at which information travels.)<sup>xix</sup> Slower speeds may be adequate for basic usage, such as browsing the web or email. Students or telecommuters generally require 5 to 25 Mbps. Higher speeds are necessary for multiple users or higher demand functions, such as videoconferencing.

Almost all of Monroe County – and all of the City of Rochester -- has access to 25 Mbps broadband internet service. But not all households subscribe. (Figure 1)

### Internet Subscription Rates<sup>xx</sup>

	Monroe County	City of Rochester
<b>No Internet</b>	20%	31%
<b>No Wired internet</b>	28.7%	46.6%
<b>Smartphone Internet Only</b>	6.4%	12%
<b>No Computer</b>	13.3%	20%

Figure 1

Census data tells us nearly 27,000 households in the city don't have internet at home, ranking Rochester as one of the worst-connected cities in the country.<sup>xxi</sup>

There are several reasons why broadband adoption rates lag in Rochester: affordability, education and lack of digital readiness.

Pew Center has found that half of non-broadband subscribers cited cost as the reason they don't have fixed broadband at home.<sup>xxii</sup> Indeed, internet adoption rates increase with income, according to census data. (Figure 2) When we map internet adoption in the city, we find a close correlation with poverty. (Figures 3 and 4)

### Rate of Households With No Internet by Income Level<sup>xxiii</sup>

Household Income	Monroe County	City of Rochester
<b>Less than \$20,000</b>	45%	47.8%
<b>\$20,000 to \$75,000</b>	22.9%	27.8%
<b>More than \$75,000</b>	4.7%	8.4%

Figure 2

### Households With No Internet Subscription<sup>xxiv</sup>

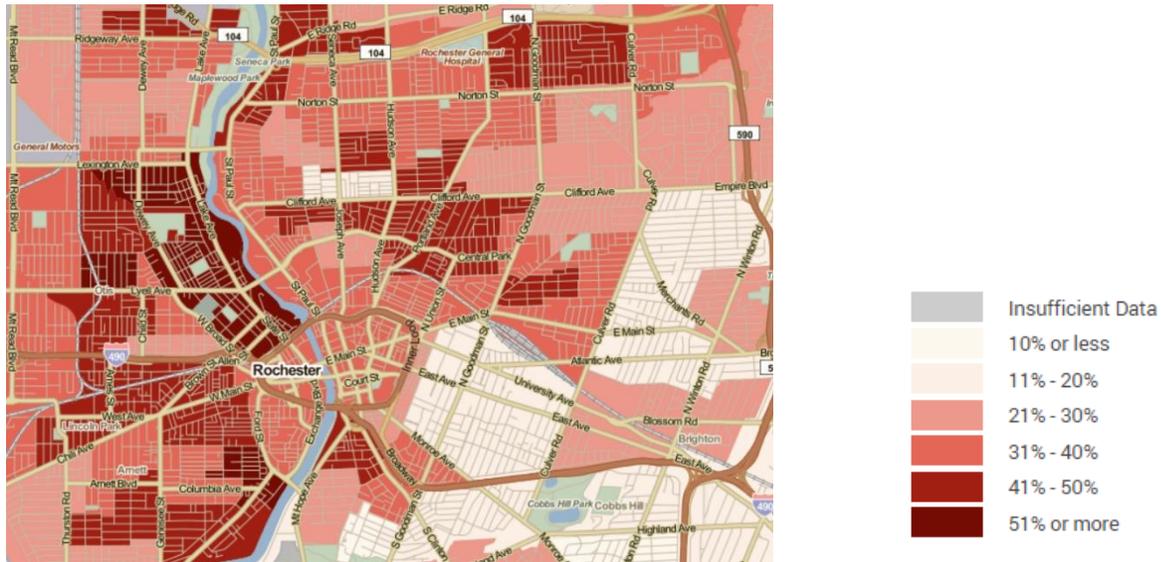


Figure 3

### Households in Poverty<sup>xxv</sup>

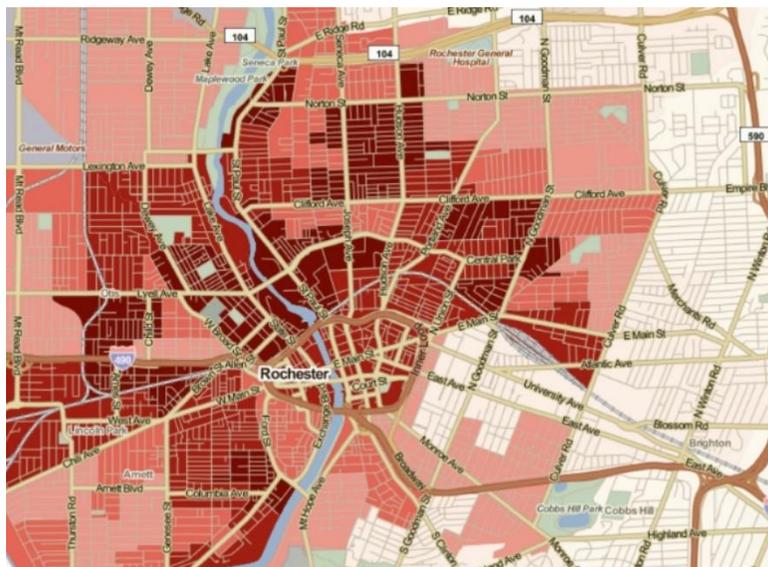


Figure 4

There are entire neighborhoods that are largely disconnected from the internet. People without broadband often turn to the public library system, which offers robust internet programs, including digital literacy classes. The library system recognizes its role in bridging the digital divide, offering free Wi-Fi and computers equipped with Microsoft programs and printing

capabilities, as well as classes in computing. But the city’s libraries have limited hours, with some closing as early as 6 p.m. some weekdays and all closing on Sundays.<sup>xxvi</sup> There are also cafes and stores with free internet, but those are typically not located in high-poverty neighborhoods.

Rochester’s digital divide can also be attributed to educational levels, according to data from the census. (Figure 5)

**Education and Internet Subscription and Computer Ownership Rates<sup>xxvii</sup>**

	<b>Without Internet</b>	<b>Without Computer</b>
<b>Less Than High School</b>	45%	32%
<b>High School Degree</b>	30%	18%
<b>College Degree</b>	11%	5%

Figure 5

Many people are not “digitally ready,” according to a Pew Internet Research study.<sup>xxviii</sup> They’re not confident in their ability to use computers, trust online information or use digital tools for learning. People in lower-income households and with lower levels of education are more likely to lack digital readiness, as are minorities and senior citizens. Even if the internet is accessible to these individuals, they may not own computers or be willing to adopt broadband without educational interventions.

The digital disparity exacerbates existing inequalities. Families that do not have access to wired broadband internet are less likely to do to certain online activities, including banking, shopping, job-hunting or reading the news.<sup>xxix</sup> Children from low and moderate income families who lack internet at home are less likely to go online to explore their interests.<sup>xxx</sup>

The lack of access to the internet has had major ramifications for the RCSD, which estimates 40 percent of its students do not have broadband at home. District leaders passionately believe children need access to broadband at home. Students must be able to complete homework tasks requiring email, viewing videos or uploading files. They must learn critical tools to function in a digital world. The district has been unsuccessful in efforts to secure public funding for various solutions, with state grants reserved for increasing rural access. The district recently secured a partnership with a private foundation to provide mobile hotspot devices to 4,000 students.<sup>xxxi</sup>

## The Marketplace

Although critics complain broadband companies operate like a monopoly – keeping internet prices high - we see that Rochesterians have more than one choice for internet service. There is not a broadband monopoly in Rochester. Researchers have found that product differentiation - in this case, “quality distortion,” is a main factor in broadband pricing.<sup>xxxii</sup> Cable companies like Spectrum are dominating the broadband industry nationwide because they typically offer superior quality to the competition. Verizon and AT&T are similarly dominating the wireless space.<sup>xxxiii</sup> Consumers accustomed to high-performing, high-speed broadband don’t feel like they choices.

Here are the major residential internet service providers in Rochester:

**Spectrum** – The cable giant, previously doing business under the names Time Warner and Charter, won’t reveal its market share in Rochester. The company recently boasted 1.5 million customers in Upstate New York,<sup>xxxiv</sup> meaning it has a minimum market share of 40 percent. Market share in Rochester is likely much higher, however, because Spectrum does not operate in all Upstate markets. Spectrum offers 100 Mbps service. The company’s internet-only plan is \$65.99 a month,<sup>xxxv</sup> not including taxes and fees, as well as charges for modem rental. New customers may be able to obtain lower prices for a limited time or package deals.

The Spectrum Internet Assist program offers speeds of 30 Mbps for \$14.99 a month without any modem rental fee. In order to qualify, households must have children receiving free or reduced-price lunches at school or Supplemental Social Security Income. Households must not be current customers or have any outstanding debts.<sup>xxxvi</sup>

Spectrum delivers internet using the same coaxial cables that it uses for television service. Speeds are generally between 10 Mbps and 500 Mbps. Cable internet speeds can be impacted by high usage in a neighborhood.<sup>xxxvii</sup>

**Frontier Communications** – Rochester’s legacy phone company offers a \$27.99 a month plan that provides maximum speeds of 6 Mbps. A \$34.99 a month plan offers maximum speeds of 25 Mbps, while a \$44.99 a month provides speeds of 45 Mbps.<sup>xxxviii</sup>

Frontier uses Digital Subscriber Line (DSL) technology to deliver internet over copper landline phone networks. DSL speeds are usually limited to 5 to 35 Mbps.<sup>xxxix</sup> Speeds can be dependent on the location of a household.

**Greenlight Networks** – This internet startup company is quickly moving into the Monroe County market. For \$50 a month, Greenlight offers 500 Mbps broadband. Gigabit service – considered the holy grail for residential internet users – costs \$100 a month. The firm charges a \$100 installation fee.<sup>xl</sup>

Greenlight uses fiber optic cables to deliver the internet. Fiber carries data at the speed of light. This is the fastest and most reliable type of broadband internet, but it only covers about 25 percent of the United States.<sup>xli</sup>

Greenlight is building a network by leasing existing, privately-owned fiber lines and installing new lines.<sup>xliii</sup> Greenlight’s business model relies on a certain number of residential customers signing up for service before it will build out the “last mile” of the fiber network. Greenlight has not invested in most City of Rochester neighborhoods, prompting one observer to say in a Facebook discussion group, “Greenlight appears to be redlining the city.” Redlining refers to the practice of denying geographic areas access to services and capital, leading to decline.

**Mobile Broadband** – Mobile broadband is wireless high-speed internet. A significant number of households only have a smartphone, which typically relies on 4G networks. Most companies offer download speeds of 8 to 12 Mbps. Some plans have data caps, which can severely impact how much consumers can use their devices for broadband. Data caps largely prevent users from tethering computers to their phones for internet access. Verizon’s plans can hit \$70 a month for unlimited data. AT&T has more pricing tiers, but its unlimited plans can cost \$90 a month. Verizon and AT&T throttle speeds for heavy users.<sup>xliiii</sup>

Carriers have not deployed 5G technology, which is expected to offer much faster speeds, in Rochester.

Smartphones do not provide the full range of internet functions and capabilities. Many websites do not load properly on mobile devices and it’s difficult to perform activities like researching a paper, filling out a job application, or telecommuting.

## Government Infrastructure

There may be opportunities to use government infrastructure to bridge the digital divide.

Monroe County is considered a “fiber-rich” community. A 2017 study of the county’s fiber infrastructure assets found that the county has an extensive fiber network, built over the past two decades. Magellan Advisors wrote, “Its network is far ahead of most of its peers in the size and capacity.”<sup>xliiv</sup> The report found that most of the network – 80 percent – is dark. The county has 389 miles of fiber cable – about 40,000 strand-miles that sit unused.<sup>xliv</sup> Not all county sites are connected to the network, costing the county \$100,000 a year for an outside provider.<sup>xlvi</sup>

The City of Rochester leases almost all its 56 miles of fiber from a private company, Fibertech (now Crown Castle), spending about \$370,000 per year.<sup>xlvii</sup> It is using about 75 percent of the bandwidth, as its fiber cables have far less strands compared to the county network.<sup>xlviii</sup> Magellan does not recommend the city invest in its own fiber infrastructure network, saying it would be duplicative.

Magellan recommended the county upgrade its fiber infrastructure into a “carrier class network” capable of distribution to multiple entities. The study suggested the city and county join networks. To that end, the study recommended the city and county collaborate on a Broadband Improvement Plan, where infrastructure is done in a “carefully planned, comprehensive, coordinated, programmatic fashion, like the approach taken by network service providers. Such

an approach will ensure the network serves all needs—unforeseen as well as planned—economically and generate the maximum public value.”<sup>lix</sup>

Magellan believes the county’s fiber network can become a revenue-producing network that would service the public sector. Magellan identified 250 governmental sites, including town and village buildings, that were within 1,500 feet of the county’s fiber and not connected to the network.<sup>l</sup> As the public sector will likely need more fiber and more flexible networks in the future, it makes sense to examine whether a single network would be more efficient and effective.<sup>li</sup>

This public sector network could be operated by a nonprofit or an authority that has a shared governance model. To that end, Magellan recommended the city and county clarify goals and relationships to each other. For example, the county’s goals could be to service the public sector and generate money. The city’s goals could be to foster economic, social and workforce development.

A Monroe County spokesman told me unification or commercialization of the network may be difficult because it is “significantly encumbered by public rights of way, easements, and other property rights.” Indeed, the Magellan study said, “The County should legally evaluate the right-of-way agreements to determine if the restrictions truly exist and whether the term might be modified to allow a greater range of uses.”<sup>lii</sup> The study suggested the city and county work together on acquiring rights-of-way to facilitate broadband development.



Fiber optic cables in manhole (Credit: Magellan)

## Policy Analysis

### Objectives

The primary goal of this analysis is to recommend policy alternatives that will increase the number of people who have affordable broadband internet at home. A secondary objective is to assist and attract businesses needing access to affordable, high-speed broadband.

### Summary of Alternatives

There are several options to bridge the digital divide in Rochester:

- **Municipal broadband network** – This would be a government-owned network, which can take two main forms: full-service retail or public-private partnership. A full-service retail model means the government owns and operates the network. A public-private partnership (PPP) means the government and private vendor share risks and rewards of owning and operating the network. There are many types of municipal broadband PPP models in existence.
- **Working with service providers** – This involves negotiating agreements with internet service providers to offer low-cost plans and free access in defined locations. This option requires the government to incentivize the private marketplace to help solve the problem of digital inequities.
- **Status Quo** – One option is to do nothing. This assumes the private marketplace, technological advancements or even a better political environment may eventually achieve our objectives.

Each alternative will be assessed on the following criteria:

- *Efficiency* – An alternative is considered efficient if it can provide the internet to the most people at a low cost.
- *Effectiveness* – An alternative is considered effective if it increases the number of people with broadband internet.
- *Equity* – An alternative is considered equitable if it provides the internet to the greatest number of people without leaving behind groups in need.
- *Administrative Feasibility* – An alternative is considered administratively feasible if it can be easily implemented.
- *Political Feasibility* – An alternative is considered politically feasible if it has support from key stakeholders, including elected officials and the public.

### Alternative Analysis

#### Municipal Broadband Network

A municipal broadband network involves the government having full or partial ownership and control. The benefit of a municipal network is that the public is not at the mercy of private

service providers, who have taken advantage of monopoly-like conditions. Community-owned broadband networks tend to be less expensive. One study of 27 localities found in 23 cases, the municipal network was between 2.9 and 50 percent cheaper over a four-year period.<sup>liii</sup> Competition has the effect of lowering prices.

Since the county owns rich fiber infrastructure, it makes sense for the city and county to create a public network entity, as recommended in the Magellan study. This entity would develop a plan for residential and business customers. The public network entity would fund construction of the network. Major decisions would have to be made about whether to partner with a private vendor, what technology to employ, whether the network would cover the entire county and what kinds of services it would offer and for what price.

## Models

Municipal broadband networks typically take one of two forms: full-service retail or public-private partnership.

A full-service retail model involves the government building, maintaining and administering its own internet network. There are a few dozen municipal broadband networks in the United States that function as full-service retail networks.<sup>liv</sup> These are networks owned by governments that treat the internet like a public utility. Most of these networks are run by a municipal power company, which is not an option in Monroe County.

A public-private partnership (PPP) can take many forms. One option is to allow private internet service providers to tap the government network for the purpose of creating additional broadband options for consumers. For example, Huntsville, Alabama spent about \$60 million on a fiber network that Google leased to provide last-mile service to homes.<sup>lv</sup> Lincoln, Nebraska, which by state law is prohibited from operating a government-owned network, leases space on its fiber backbone to multiple providers, including one that is providing gigabit service.<sup>lvi</sup>

Another option is for the municipality to own the broadband network but contract with a vendor to provide service to customers. In a PPP, the public network entity and the vendor would share the risks and rewards. For example, Westminster, Maryland decided it did not have the capacity to operate an internet service, so it issued an RFP. It has partnered with Ting to provide gigabit service to residents and businesses.<sup>lvii</sup> There are opportunities for the public network entity to negotiate terms regarding pricing, customer service (Westminster requires a human being to answer the phone!<sup>lviii</sup>) and access. The vendor could be held accountable for not meeting goals. The public network entity should maintain control over the network in the event the vendor is sold or becomes insolvent. The RCSD's community broadband feasibility study recommended a PPP model that involves contracting with a vendor to operate the network.<sup>lix</sup>

## Technology

Both fiber-to-the-home (FTTH) and Wi-Fi rely on fiber networks. Once fiber networks are built, they are relatively easy to maintain. They can be made faster with networking equipment; no upgrades to the actual fiber is necessary, leading some to call it “future proof.”<sup>lx</sup>

A fiber-to-home (FTTH) network is more expensive than Wi-Fi because every home would have to be individually connected. The distance from the backbone network to houses is referred to as “last-mile.” A 2016 study commissioned by the RCSD found a FTTH network in the city could cost as much as \$80 million, perhaps as much as \$1,050 per home. Monroe County is in a better position than many municipalities because it already has a backbone network in place. The study found that utilizing existing infrastructure could reduce the last-mile cost to \$38 million.<sup>lxi</sup> There would also be operating costs for a municipal network for things such as customer service, power consumption and equipment maintenance.

A Wi-Fi network would be less expensive than a FTTH network. Wireless technology involves setting up transmitters on cell towers, buildings or poles. Wireless networks allow mobility and flexibility. People can connect with their devices from anywhere.

Wireless networks have downsides:<sup>lxii, lxiii</sup>

- They are susceptible to weather conditions.
- They may not perform well if there are physical barriers, such as buildings or trees.
- The user must be physically close to the access point.
- They cannot send large amounts of data.
- They get congested with multiple users.

The RCSD feasibility study found a Wi-Fi network could cost \$16.8 million to install and nearly \$3 million a year to operate.<sup>lxiv</sup> The RCSD suggested such a network would be free to those who are willing to be subjected to advertisements and filtered content. People who want to bypass ads could pay a fee and provide revenue for the network.

The FCC believes people need both fixed and wireless broadband to fully participate in the digital world. The FCC does not consider mobile broadband to be adequate on its own.<sup>lxv</sup>

This project does not make specific recommendations regarding the technology or the model a municipal broadband network should use beyond the formation of a public entity network. These decisions would require further study, as well as extensive input from stakeholders.

“Policymakers tend to get very focused on the technology instead of what they’re trying to accomplish with the technology. It’s inevitably a fail,” Greg Laudeman, lead author of the Magellan study, told me.

*Efficiency:* A municipal broadband network would achieve the objective of increasing the number of households with broadband, when combined with other measures to increase adoption. A municipal broadband network would likely come at great cost, but those costs are in line with other infrastructure projects. At minimum, the county network would have to be upgraded to a carrier class network that would allow service providers to lease fiber.

*Effectiveness:* A municipal network would likely reach all residents and businesses. Simply providing the internet, however, may not lead to a dramatic increase in adoption rates. It would be important to tailor outreach programs to the needs of residents, whether its digital readiness or a lack of equipment. A full-service retail network would likely be more effective in reaching the target population than a PPP, but effectiveness would depend on the structure of a PPP agreement.

*Equity:* No one would be left behind if municipal broadband service is affordable and measures are in place to overcome other barriers to adoption, such as education and equipment.

*Administrative Feasibility:* The first large hurdle to overcome would be the creation of a public network entity. A public network entity would remove most administrative burdens from day-to-day staff, as the entity would be charged with planning and implementation. City and county officials, however, would have to remain heavily engaged. The public network entity would face enormous tasks, such as upgrading the county network and planning and developing future uses. A PPP would be more administratively feasible than a full-service retail network.

*Political Feasibility:* Local politicians have largely remained silent on bridging the digital divide. The public, while frustrated with its choices, is not clamoring for municipal internet. The issue would require leadership and advocacy that does not currently exist. Making matters more difficult, virtually all major elected officials receive campaign contributions from the big telecommunications firms, who have a deep interest in maintaining the status quo. The city and county, which can have a frosty relationship, would have to engage in an unprecedented collaboration. A PPP would likely be more politically feasible than a full-service retail network, as government would not shoulder all the risk.

### Working With Service Providers

This option involves the City of Rochester, which has the greatest concentration of households without internet and a cable franchise, negotiating with existing internet service. This route can take several forms.

First, the city could negotiate with providers to offer new tiers of service that are affordable. These talks could occur while the city negotiates franchise agreement renewals with Spectrum. Spectrum's current discounted program for low-income families, however, is not well-marketed and has many barriers. It would likely take significant outreach to get families to sign up; one study shows discounted programs reach only 6 percent of eligible families.<sup>lxvi</sup> These programs also cannot reach a significant population of students who are homeless.<sup>lxvii</sup>

This approach has not worked in the past. Annmarie Lehner, Chief Information Officer for the RCSD told me that Lifeline agreed to cover \$9.99 a month for home internet for low-income families. The district asked the city to negotiate with Spectrum to lower the \$14.99 a month cost for its low-income assistance program to \$9.99. RCSD said it would register families. The city agreed to make this part of its franchise renewal negotiations with Spectrum. The company said no, and the discussion ended, according to Lehner.

Second, the city could negotiate with providers to provide free service at public housing or other locations in low-income areas. The providers could get good publicity in return for signing the agreement.

Third, the city could pressure the New York Public Service Commission to negotiate on behalf of low-income customers. Stop the Cap, a consumer advocacy group based in Rochester, helped broker a no-restriction \$14.99 a month internet plan with Time Warner. The three-year deal has since expired, but customers can keep their plans. Stop the Cap's director, Phillip Dampier told me he is barred from sharing data on the numbers of people who signed up because it is considered proprietary. Dampier added that the subscription rates were low.

*Efficiency* – This option costs the city nothing, but it likely will not result in widespread increased adoption of broadband internet. Past efforts have failed to result in large numbers of people signing up for discounted plans.

*Effectiveness* – Working with existing providers to get more people online at a low cost would likely not achieve the objective. The providers have not shown a willingness to work with governments on expanding options.

*Equity* – There is not a high likelihood that the people who need internet the most would benefit from this approach, as previous agreements to offer discounted service have not been successful in increasing adoption.

*Administrative Feasibility* – The city has the capacity in its legal, innovation and economic development departments to reach out to providers and negotiate agreements.

*Political Feasibility* – There is incentive for politicians to score a win by negotiating a great deal for consumers. The willingness to undertake these efforts, however, has not been present.

## Status Quo

The community has the option to not undertake further efforts to bridge the digital divide. Under this alternative, Rochester can wait for new technologies and new vendors to emerge that could close the digital divide more effectively and efficiently than other options.

One promising effort is currently under way. The RCSD recently secured a partnership with the charitable foundation 1Million to provide mobile hotspots to high school students. The RCSD sees this as a big win for its students who previously had no access to broadband at home. This technology, however, is not as fast or reliable as fixed broadband. It does not reach all households. The partnership could also end one day.

*Efficiency* – The status quo alternative costs nothing, but also does nothing to solve the problem.

*Effectiveness* – Existing efforts, such as the 1Million initiative, will likely increase the number of people online. These efforts fall short of reaching all residents in need.

*Equity* - This alternative maintains digital inequality.

*Administrative Feasibility* - This alternative doesn't require anything from government.

*Political Feasibility* - This alternative is politically feasible, which is why elected officials have not prioritized bridging the digital divide.

The chart below (Figure 6) scores our alternatives based on our criteria, with 1 being the lowest score and 5 being the high score. A municipal broadband network scores the highest on achieving our objective, particularly because it’s the most effective and equitable way to bridge the digital divide.

### Scoring Alternatives

	Efficiency	Effectiveness	Equity	Administrative Feasibility	Political Feasibility	Total
<b>Municipal Broadband</b>	3	5	5	1	1	15
<b>Working With Service Providers</b>	2	2	2	4	3	13
<b>Status Quo</b>	1	1	1	5	5	13

Figure 6

## Policy Implementation

### Important Actors

Implementing a municipal broadband network would involve many actors with varying degrees of control over outcomes. Here are official actors who would have enormous control over the implementation of this policy alternative. Official actors have formal authority to enact policy change.

**Rochester Mayor (high influence, high stake):** Without leadership from the top at City Hall, this policy alternative would fail. The mayor would have to agree to collaborate with the county on the creation of a public network entity, as well as setting out goals for the network and policies governing the network. The city would also likely be expected to contribute funds to the public network entity.

**Rochester City Council (high influence, high stake):** The nine-member City Council would have to sign off on any agreements to create a public network entity and fund the entity.

**Monroe County Executive (high influence, high stake):** As with the city, without support from the county’s top elected leader, this proposal cannot move forward. The county owns the backbone network on which municipal fiber depends. The county would have to agree to the creation of a public network entity. The county would have to agree to upgrade its network to carrier class. The county would have to fund a public network entity.

**Monroe County Legislature (high influence, high stake):** The 29-member county legislature would have to approve the creation of a public network entity, as well as any required funding.

**New York State Legislature (high influence, low stake):** Members of the Rochester delegation to Albany may be able to secure grants for a municipal broadband network.

**New York Governor (high influence, low stake):** The governor of New York has tremendous control over grants for a municipal broadband network through agencies including Empire State Development, which runs the Broadband for All program and Regional Economic Development Councils.

**Congressional Delegation (high influence, low stake):** Rochester's congressional representative may be able to secure federal funding for a municipal broadband network. This position is important when it comes to federal attempts to curtail municipal broadband networks. The congressional representative also traditionally has high influence over same-party actors in the local political arena.

There are also unofficial actors who would play a role in the implementation of a municipal broadband network. They do not have authority to enact policy change but could influence implementation in various ways.

**Rochester City School District (low influence, high stake):** The district estimates 40 percent of its students do not have internet access at home. District leaders have been pushing for solutions so their students can fully participate in educational opportunities. Thus far, they have not had access to funding or infrastructure beyond philanthropy.

**Public (high influence, high stake):** These are consumers, a portion of whom would be expected to adopt this new internet service. They are also taxpayers who would be expected to foot the bill for any public expenditures. They are citizens whose support would play a role in the decisions of elected officials.

**Anti-Poverty Organizations (low influence, high stake):** Agencies and community organizations serving people in poverty would have a stake in a municipal broadband network. They would be likely partners in outreach and education. They could be early supporters of efforts to bridge the digital divide, and their input would be valuable in shaping the project.

**Internet Service Providers (high influence, high stake):** The private internet service providers have a large stake in the actions taken by government to bridge the digital divide. They employ lobbyists and make campaign contributions, which can influence over elected officials. They also have a virtual monopoly and have great control over prices and infrastructure.

**Businesses (high influence, high stake):** Access to high-speed broadband internet is critical for businesses in today's economy. The availability of gigabit service influences where businesses locate. Offering more affordable fiber internet could help existing businesses, foster a start-up culture and potentially attract new businesses to the city.

Below is a map of our official and unofficial actors. The governor, mayor, county executive, city council and county legislature are placed on the anti-municipal broadband side of the chart. While they have not explicitly opposed municipal broadband, they haven't expressed support or

prioritized bridging the urban digital divide. The public and businesses have expressed desire for more internet options, but have not weighed in on municipal broadband, so they are in the middle of our chart. The RCSD and anti-poverty organizations are supporters of bridging the digital divide.

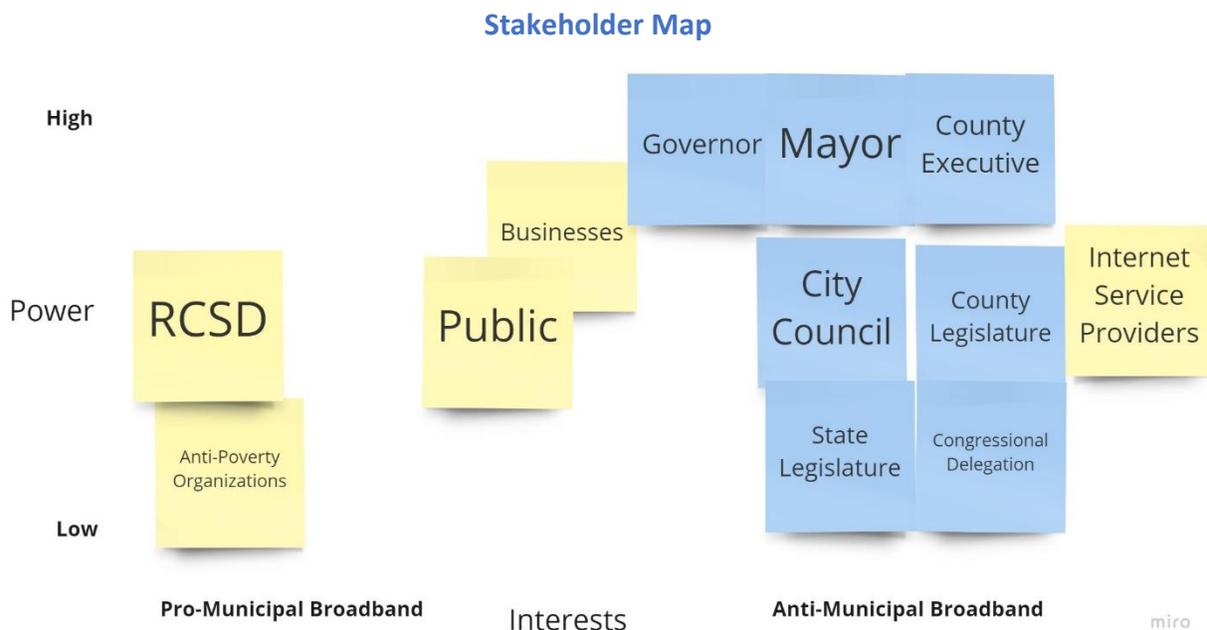


Figure 7

## Implementation Considerations

There are many factors that could impact the implementation of a municipal broadband network. Challenges include political support, finances, planning and public support and socioeconomic factors. Enablers are the area’s anti-poverty network and existing fiber infrastructure.

### Challenge: Political Support

Rochester’s elected officials have not prioritized the digital divide.

The RCSD’s Chief Information Officer, Annmarie Lehner, obtained funding for a district study of the issue in 2016 and served as a convener of local leaders. While Rochester is a fiber-rich area, she told me, “Nobody really knew what was there and who was using what.” Around the same time, the county funded the \$75,000 Magellan study to assess its fiber infrastructure and determine uses.<sup>lxviii</sup> The county did not act on the Magellan study; this paper marks the first time its findings are being made public.

Lehner found the city to be lukewarm to alternatives. Lehner said the county was only interested in the fiber network if it could generate revenue. “There wasn’t a great vision of what could be

done to benefit the city and the county,” Lehner said. “We were frothing at the mouth and we couldn’t make it happen.”

The RCSD’s broadband study recommended using the RCSD’s existing leased fiber network for either a Wi-Fi or FTTH network. The RCSD applied for state funding through the New York State Broadband Program Office, which received an infusion of \$500 million from the governor in 2015.<sup>lxix</sup> The focus of the office was on underserved rural areas, yet the director encouraged the RCSD to apply for funding and ask for a waiver. That director left and was replaced by someone who was not supportive, Lehner said. The RCSD never received a response to its grant application.

Politicians would be under enormous pressure from internet service providers who would want to maintain the status quo. These providers employ lobbyists and collectively donate millions of dollars to politicians and political parties. Below is a snapshot of the money flowing to powerful officials and entities in the Rochester region. (Figure 8) Telecommunications firms are willing to spend money to influence the political process. If any municipal broadband proposal is seriously considered, it is reasonable to expect donations to skyrocket and internet service providers to take a keen interest in electoral outcomes.

Campaign Contributions January 2013 to September 2019<sup>lxx, lxxi</sup>

	Cablevision	Charter***	Comcast	AT&T	Verizon	Fibertech****	Sprint	T-Mobile	Total
<b>Gov. Andrew Cuomo</b>	\$ 332,500	\$ 75,000	\$ 110,800	\$ 101,650	\$ 35,000		\$ 7,500	\$ 2,000	\$ 664,450
<b>Rep. Joseph Morelle (D-NY25)*</b>	\$ 9,500	\$ 13,600	\$ 14,000	\$ 11,632	\$ 4,750		\$ 3,000		\$ 56,482
<b>Monroe County Democratic Committee</b>		\$ 16,500			\$ 9,000	\$ 20,000			\$ 45,500
<b>Monroe County Republican Housekeeping Committee **</b>					\$ 5,000	\$ 27,000			\$ 32,000
<b>State Sen. Rich Funke (R-NY55)</b>		\$ 13,000		\$ 1,000	\$ 2,250	\$ 500			\$ 16,750
<b>State Sen. Joseph Robach (R-NY56)</b>		\$ 8,800							\$ 8,800
<b>Mayor Lovely Warren (D)</b>		\$ 3,500							\$ 3,500
<b>County Executive Cheryl Dinolfo</b>						\$ 3,000			\$ 3,000
<b>Asm. Peter Lawrence (R-NY134)</b>				\$ 300	\$ 550				\$ 850
<b>Asm. David Gantt (D-NY137)</b>				\$ 500					\$ 500
<b>Total</b>	<b>\$ 342,000</b>	<b>\$ 130,400</b>	<b>\$ 124,800</b>	<b>\$ 115,082</b>	<b>\$ 56,550</b>	<b>\$ 50,500</b>	<b>\$ 10,500</b>	<b>\$ 2,000</b>	<b>\$ 831,832</b>

Figure 8

\*Includes contributions to state and federal campaign committees. \*\*\*\*Fibertech is now known as Crown Castle.

\*\*Includes contributions to Monroe County Republican Campaign Committee.

\*\*\*Includes contributions from Time Warner Cable.

## Challenge: Finances

There are numerous funding streams available for a municipal broadband network. New York State awards tens of millions of dollars every year to the Finger Lakes Economic Development Council for economic development projects. Rochester was awarded \$500 million through the Upstate Revitalization Initiative for economic development and anti-poverty projects. The governor and state legislature have power to award funding outside of these initiatives. The city and the county have can bond for capital projects. The city receives federal Community Development Block Grant Funding. Bonds could also be issued for the project.

Supporters of a municipal broadband network would have to make a strong case to secure funding. As an infrastructure project, tens of millions of dollars in upfront costs are not unreasonable. Municipalities spend millions on roads, sewers, bridges and building repairs. The RCSD is completing a \$1 billion school modernization project. The county recently completed a \$79 million airport renovation project.<sup>lxxii</sup> The mayor wants to spend more than \$30 million on several new police stations<sup>lxxiii</sup> and \$23.5 million on a downtown outdoor performance space.<sup>lxxiv</sup>

As an economic development project, municipal broadband costs are in line with the Buffalo Billion initiative, which included the state shelling out \$750 million for a solar factory that is expected to created fewer than 1,500 jobs.<sup>lxxv</sup> While our primary objective is to increase digital equity, a municipal broadband network could also assist and attract businesses. The return on investment would be from increased economic activity, not necessarily profits from the network.

If Rochester were to build and operate its own network, it would be assuming considerable financial risk. There's no guarantee the networks would break even. Eleven out of 20 municipal projects that disclosed financial statements lost money between 2010 and 2014.<sup>lxxvi</sup> Only two were on track to pay off debt within the estimated 30 to 40-year lifespan of the networks.

## Challenge: Planning

The planning stage for a municipal broadband network would be extensive and require elaborate coordination among stakeholders.

A study of planning stages for municipal broadband focused on PPPs, but these suggestions would seem to apply to both the initial formation of a public network entity and the formation of a municipal broadband network. Nucciarelli, Sadowski and Achard recommend the planning process take four stages:

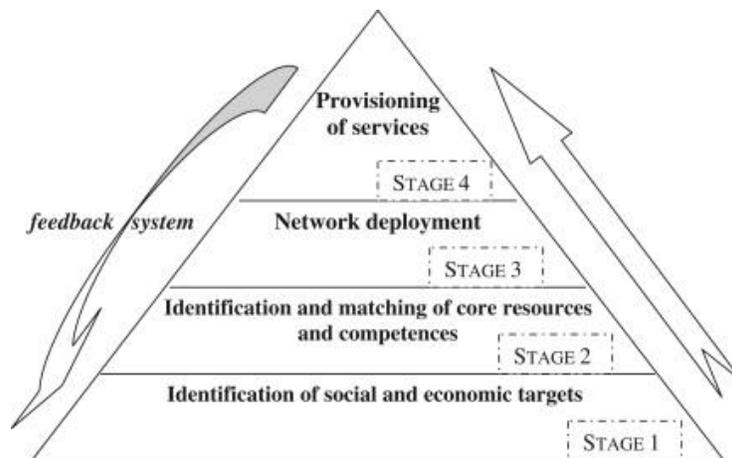


Figure 9<sup>lxxvii</sup>

The first stage involves setting goals for the network, such as bridging the digital divide or fostering workforce development. The second stage identifies what the partners bring to the table in terms of capacity, competencies and resources. The third stage involves designing the network, including setting geographical boundaries. The fourth stage is determining demand and the level of services needed to operate the network.”<sup>lxxviii</sup> The stages repeat when the network expands.

In examining failed municipal networks, Tapia and Ortiz say it’s important to have stakeholder collaboration, the active participation of the target population and flexibility regarding local needs and wants.<sup>lxxix</sup>

### Challenge: Public Support

Public support is crucial to the effective implementation of a municipal broadband network.

There are examples of municipal broadband projects where public support vanishes and trust with government is damaged. In Lagrange, Georgia, disadvantaged residents felt their tax dollars should be spent on more pressing needs. Some said they didn’t have the time or equipment to use the internet. Meanwhile, affluent residents resented their tax dollars subsidizing internet for poor residents.<sup>lxxx</sup> In Madison, Wisconsin, residents felt the municipal network was only for the wealthy and people who already had computers.<sup>lxxxii</sup> Corpus Christi delivered a network that ended up being inferior to what was promised.<sup>lxxxii</sup>

If government frames municipal broadband as the solution to social problems, that will inevitably lead to disappointment. If the project is not appropriately planned or funded, the public will be disillusioned and unlikely to support future technology projects.<sup>lxxxiii</sup> Tapia and Ortiz wrote, “The plans and actions taken by the government should match the rhetoric used by the public leaders. Plans should include the community and provide the auxiliary training and

support necessary to build users instead of networks. Mismatched plans and rhetorical promises may do more harm than good.”<sup>lxxxiv</sup>

Currently, there is no groundswell of support for a public internet option. There is reason to believe, however, that a well-reasoned proposal that outlines public benefits could achieve significant backing from residents and the business community. Cable and internet service providers consistently rank at the bottom of customer satisfaction surveys.<sup>lxxxv</sup> Consumers would likely welcome new, affordable options. Greenlight Fiber’s arrival into Rochester area neighborhoods is routinely cheered.<sup>lxxxvi</sup>

Rochesterians are skittish about major “out of the box” projects as a result of the failed Rochester-Toronto fast ferry. The city’s multi-million venture to attract businesses and tourists in the mid-2000s was a spectacular flop. It’s common to hear residents refer to new project ideas as “another fast ferry.”<sup>lxxxvii</sup>

The creation of a public network entity could be controversial. A county spokesman told me the idea “would look, sound, smell, and act like an LDC – and that was a non-starter.” The county had several local development corporations that became embroiled in bid-rigging scandals.<sup>lxxxviii</sup> The LDC’s, however, had little public oversight or participation. A public network entity could be structured in a way to avoid those shortcomings.

Efforts to engage the public and gain public support should be transparent and inclusive. It’s important to include citizens in planning, as well as to clearly communicate goals and expected outcomes.

### Challenge: Socioeconomic Factors

Simply giving people internet won’t mean they will use it. A crucial component of a successful implementation would be to do education and outreach in underserved communities. If people are given free internet without these supports, there’s a risk in exacerbating existing problems and damaging trust in government.<sup>lxxxix</sup> It is extremely important to engage those who do not currently have home broadband to determine needs and barriers to adoption.

Pew found a growing number of people believe smartphones are adequate for their needs. These individuals are more likely not to have completed college.<sup>xc</sup> As we have discussed, affordability isn’t the only barrier to internet adoption. A lack of digital readiness and lack of equipment at home are major factors in why people don’t subscribe.

Brookings summarized how communities can address digital readiness:<sup>xci</sup>

“Addressing multiple adoption barriers at the same time is vital, but it will not be cheap. Educators in community centers of all kinds will need to teach skeptical households and those struggling with digital literacy. Equipment will need to be bought, both to outfit community centers and to directly support individuals. Likewise, fully funded marketing campaigns...are critical to reach the right people in the right neighborhoods. Orchestrating these complementary but separate efforts will require management staff

inside and outside government, who must be paid. Government can certainly play a role in all this, but efforts at this scale will also require coordination with the private sector and civic institutions that have much to gain.”

#### Enabler: Anti-Poverty Infrastructure

We have the organizational infrastructure in Rochester to conduct needed education and outreach. There are numerous community organizations, including the settlement houses, Urban League and Action for a Better Community that can play a role in addressing the gaps. The City of Rochester has a savvy communications department capable of largescale marketing campaigns. The public library system is already doing critical work in bridging the digital divide. The Rochester City School District would certainly play a large role in making sure its students used internet at home. The district already has Chromebooks ready to deploy.

#### Enabler: Fiber Infrastructure

As we look for options to bridge the digital divide, the fact Monroe County has built this network is important. Many communities launch municipal networks using government-owned fiber to varying degrees. Erie County is just beginning the process of building a backbone network to explore municipal options— at a cost of \$20 million – demonstrating the tremendous value of Monroe County’s existing infrastructure.<sup>xcii</sup>

## Leading Policy Change

Leading the formation of a municipal broadband network will require unprecedented collaboration between the city and county, significant public resources, extensive citizen involvement and strong planning and execution.

I will use Bolman and Deal's Four Frames of Leadership to walk us through leadership of the creation of a municipal broadband network. The four frames include political, structural, symbolic and human resources. Our tasks mainly lie in the *political*, *structural* and *symbolic* frames.

Many people find politics distasteful. We cannot ignore, however, the reality of what needs to happen in order to create a municipal broadband network. The political frame requires leaders to evaluate situations by examining power dynamics. They must approach the decision-making process in the context of the actors' interests and the availability of resources.<sup>xciii</sup>

Creating a municipal broadband network is a massive undertaking requiring competent planning and implementation. The structural frame involves how organizations divide and coordinate work. It is important to have clear objectives, roles, and relationships.<sup>xciv</sup>

Building public and political support for municipal broadband will require explaining the importance of the effort. The symbolic frame takes leaders through the process of creating meaning for the project.<sup>xcv</sup> Symbols can be stories, values, culture and plans.

### Create a Sense of Urgency

Leaders must create a sense of urgency about the need to bridge the digital divide. The political frame suggests networking with stakeholders and raising the alarm. The structural frame involves sharing information about the problem, such as data and maps detailing the digital divide.

When they enter the symbolic frame, leaders will craft a narrative about bridging the digital divide. Leaders can tell stories about students who can't do schoolwork at home or residents who sit in the McDonald's parking lot late at night to apply for jobs using the restaurant's Wi-Fi. Outreach in the community can entail various degrees of marketing, such as producing a website or printed materials about the effort.

### Build a Coalition

Leaders must form a coalition to work on municipal broadband. Building networks requires mapping the political terrain, which means asking whose help is necessary. The map includes the players, their level of power and their interests. Leaders will need to gauge the level of support or resistance from each player, as well as their motivations. Leaders must figure out how to communicate with each player and develop relationships.<sup>xcvi</sup>

The structural frame calls for a task force that includes all stakeholders to work on the project. Task forces are necessary for complex projects requiring collaboration and multiple specialties.<sup>xcvii</sup> The task force should be of manageable size and have the right mix of expertise. The group will need to define goals, specify required actions, assign roles, pick a leader and develop a decision-making process. Task force members should identify members' strengths and priorities. Group members should be committed to the goal, working with each other and holding themselves accountable. The public should be informed of the task force's progress. The task force should also determine how it will define success.<sup>xcviii</sup>

### Establish a Vision

The municipal broadband project must include a vision of bridging the digital divide. In the political frame, leaders set the agenda and the strategy for getting it done. The structural frame involves making a step-by-step blueprint.

As we move into the symbolic frame, the blueprint or plan for municipal broadband can become a symbol to motivate stakeholders and maintain legitimacy. Plans offer benchmarks, guidance and reassurance.<sup>xcix</sup>

The vision must include a sense of purpose driving municipal broadband. Unlike the private marketplace, municipal broadband will have values tied to equity, opportunity and democracy. These values can unite people around a common goal.

### Empower Stakeholders

Stakeholders must be empowered to make decisions, provide resources and give input. The structural frame requires the task force to be empowered by government agencies to cut through red tape, such as obtaining contracts regarding rights-of-ways.

In the political frame, leaders will have to empower change by removing obstacles to success. That could mean new people in elected office and increased public awareness. Player positions could change for each step of the process, from obtaining funding to signing agreements for a public network entity. There will likely be bargaining and negotiations to move stakeholder positions on the map for each step.

### Celebrate Short-Term Wins and Sustain the Effort

Municipal broadband will take time to develop, requiring strategies to maintain public support and internal enthusiasm.

Leaders in the structural frame understand projects of this magnitude require enacting in stages. Shifting to the political frame, leaders may need to obtain more resources and authority to sustain progress.

In the symbolic frame, leaders serve as cheerleaders. Milestones, such as securing a grant, should be celebrated. Resident work sessions on the project can foster a sense of community belonging. Leaders must sustain the effort by building on each win.

## Make the Network Real

The municipal broadband network will need to be institutionalized.

One of the biggest challenges will be establishing the governance model for the public network entity. In the structural frame, questions regarding roles, funding, rules, ownership and staffing must be resolved. For example, will this entity be governed by a board that hires an executive director? How many seats on the board will be afforded to the city and county? Will it be a nonprofit government subsidiary? If the public network entity opts for a PPP, there will be organizational challenges related to the operational relationship. The organizational structure should best fit the core functions and strategy and goals.

In the political frame, leaders must take precautions to make sure the network cannot be easily dismantled. Moving into the symbolic frame, leaders will hold a big celebration when the network is turned on for public use.

## Recommendation

While building a municipal broadband network will be complicated and costly, it is necessary to make sure all citizens can fully participate in educational and economic opportunities. A municipal broadband network is equitable, as everyone can afford to access broadband. A municipal broadband network is efficient, as it would increase the number of households with broadband for the same amount of money as other important infrastructure projects. A municipal broadband network is effective, provided it is coupled with outreach and education to target populations. Enacting the policy will require strong leadership that can create a sense of urgency, build coalitions, secure resources, form a task force to study options and guide implementation, and maintain public support.

## Conclusion

Broadband internet opens the door to the world's knowledge, providing the opportunity for citizens to reach their full potential. Education is a way out of poverty. Yet thousands of individuals and families don't have a primary educational tool at their disposal. This lack of broadband adoption perpetuates inequality. It also deprives our region of entrepreneurs, scientists and others who could contribute in profound ways if given the chance.

A municipal broadband network supports the region's technological focus and includes all citizens in the modern economy. It is time for the public sector to show the same spirit of innovation that has propelled Rochester's past – and will undoubtedly propel its future.

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