



# THE HUMAN INFRASTRUCTURE of BROADBAND: LOOKING BACK, LOOKING AROUND, and LOOKING AHEAD

by **AMELIA BRYNE** and **REVATI PRASAD**

Published by the **BENTON INSTITUTE** for **BROADBAND & SOCIETY**

**JANUARY 2025**

# THE HUMAN INFRASTRUCTURE OF BROADBAND: LOOKING BACK, LOOKING AROUND, AND LOOKING AHEAD

by **Amelia Bryne** and **Revati Prasad**

Published by the **Benton Institute for Broadband & Society**

**January 2025**



Broadband Delivers Opportunities  
and Strengthens Communities

1041 Ridge Road, Unit 214  
Wilmette, IL 60091  
[benton.org](http://benton.org)

**The Human Infrastructure of Broadband** project  
was made possible with support from The Pew Charitable Trusts

This work is licensed under the Creative Commons Attribution-Noncommercial 3.0 United States License. A copy of this license is available at [CC BY-NC 4.0 Deed](https://creativecommons.org/licenses/by-nc/4.0/) | [Attribution-NonCommercial 4.0 International](https://creativecommons.org/licenses/by-nc/4.0/)

Please include the following attribution when citing this report: Bryne, Amelia, "The Human Infrastructure of Broadband: Looking Back, Looking Around, and Looking Ahead" Wilmette, IL: Benton Institute for Broadband & Society, January 2025. [benton.org/publications/human-infrastructure](http://benton.org/publications/human-infrastructure)

---

# CONTENTS

<b>INTRODUCTION</b> .....	4
<b>CONNECTION IS MORE THAN WIRES: Why Broadband Requires a Human Infrastructure</b> .....	7
WHAT'S IN A NAME? Digital Navigation and the Human Infrastructure of Broadband .....	9
<b>LOOKING BACK: Tracing the History of the Human Infrastructure of Broadband</b> .....	11
1970s-1990s: Universal Access and the Digital Divide .....	11
EARLY 2000s: A More Nuanced View .....	12
2020-PRESENT: Digital Navigation and Digital Equity .....	14
<b>LOOKING AROUND: Mapping the Human Infrastructure of Broadband</b> .....	15
METHODOLOGY .....	15
LANDSCAPE ASSESSMENT .....	16
<b>The TAXONOMY of the HUMAN INFRASTRUCTURE of BROADBAND</b> .....	21
Figure 1: Taxonomy of Human Infrastructure of Broadband .....	21
<b>CORE</b> — Organizations with Digital Equity at Their Core .....	22
Libraries, the Original Digital Navigators .....	22
Digital Equity-Focused Nonprofits .....	23
<b>COMPLEMENTARY</b> — Integrating Digital Equity Into Other Support and Services .....	24
Health, Education, and Housing Agencies .....	24
Nonprofits with Broader Missions .....	25
Tribal Entities .....	26
<b>COALITION</b> — Working Collaboratively to Advance Digital Equity .....	27
<b>LOOKING AHEAD</b> .....	28
<b>ENDNOTES</b> .....	29
<b>AUTHORS</b> .....	33

---

# INTRODUCTION

As the COVID-19 pandemic came to the United States in early 2020, access to the internet and the skills to navigate it became more critical than ever for students, workers, and families, as school, work, and socializing were pushed online. Simultaneously, the institutions that typically aided community members with internet access and use—like libraries and schools—were required to shut their doors to the public and provide services remotely, if at all. Those who relied on these institutions were suddenly left without access and risked higher viral exposure during the COVID-19 pandemic than people with established home internet access.<sup>1</sup> Many communities were faced with the dilemma: How do we (remotely) assist people to get online? A burst of activity nationwide among digital inclusion advocates helped get and keep Americans connected. Across the country, local governments, libraries, schools, nonprofits, and digital navigators set up public-access Wi-Fi networks, lent out hotspots and laptops, provided tech support by phone, and enrolled people in low-cost broadband service options.<sup>2</sup>

While we have gradually returned to in-person interactions, the pandemic starkly highlighted the divide between those who are digitally connected in America and those who are not, while simultaneously accelerating and intensifying the digitization of daily life. To help bridge this divide, the U.S. federal government committed \$65 billion through the Infrastructure Investment and Jobs Act (IIJA) to address broadband availability, affordability, and adoption, including \$2.75 billion for the Digital Equity Act (DEA), which aims “to ensure that all people

and communities have the skills, technology, and capacity needed to reap the full benefits of our digital economy.”<sup>3</sup> Importantly, Digital Equity Act funds do not primarily support physical broadband infrastructure—which is the focus of federal investments through the \$42.5 billion Broadband Equity Access and Deployment (BEAD) Program—but the human infrastructure of broadband.

The human infrastructure of broadband refers to the people and organizations who provide direct support to individuals to access affordable internet and devices and teach people the digital skills necessary to make use of connectivity and fully participate in modern society.

Although the term is new, the human infrastructure of broadband is not, nor is it static. This human support has evolved alongside the internet, computers, and the ongoing digitization of our culture and society. As

**THE HUMAN INFRASTRUCTURE OF BROADBAND REFERS TO THE PEOPLE AND ORGANIZATIONS WHO PROVIDE DIRECT SUPPORT TO INDIVIDUALS TO ACCESS AFFORDABLE INTERNET AND DEVICES AND TEACH PEOPLE THE DIGITAL SKILLS NECESSARY TO MAKE USE OF CONNECTIVITY AND FULLY PARTICIPATE IN MODERN SOCIETY.**

the nation prepares to invest in these people, organizations, and programs, policymakers and practitioners must understand the need for and needs of the human infrastructure of broadband in order to ensure the equitable and sustainable use of physical infrastructure.

This report is the first piece of a larger research effort by the Benton Institute for Broadband & Society and several collaborating organizations that aims to help both policymakers and practitioners better understand:

1. What constitutes the human infrastructure of broadband;
2. How this human infrastructure helps people, particularly historically marginalized communities, make meaningful use of the internet (i.e., its value in advancing digital equity or opportunity goals);
3. How an investment in human infrastructure is necessary to ensure a return on investment in the physical infrastructure;
4. What program models and approaches can be replicated or scaled; and, most crucially,
5. How we can and should support and sustain this work and continue to strive toward digital equity even after current federal investments have ended.

This report tackles the conceptual and historical underpinnings of the human infrastructure of broadband.

Section I outlines why access to physical networks and a human infrastructure remain essential to achieving digital equity. The work of connecting people to technology has taken on different forms over the past several decades and been described by a variety of terms. Currently, the term “digital navigation” is used extensively to refer to a range of practices. However, the human infrastructure of broadband includes a broader range of people, such as ISP employees, people who teach device refurbishing, and even officials in state and local government overseeing digital inclusion work.

Section II situates current practice in this historical context to help illustrate the ongoing nature of this endeavor, including factors that are constant (like the need for equitable access to modern technology and central involvement of community organizations, especially libraries) and those that evolve, such as technology and service models.

Section III provides a landscape assessment of the current state of the human infrastructure of broadband, including who provides what support and services and to whom. With a database of more than 250 projects, this section offers a real-time snapshot of the human

and organizational resources that can be leveraged as the [Digital Equity Act](#) and the [Broadband Equity, Access, and Deployment \(BEAD\) Program](#) are implemented.

Section IV presents the taxonomy of program models that comprise the human infrastructure of broadband: core, complementary, and coalition. Delineating these models and their subtypes clarifies their comparative advantages and limitations and points to avenues for garnering resources and support.

The report concludes by previewing the companion research that will delve deeper into how the human infrastructure of broadband functions and identify effective best practices. Finally, we will outline the challenges and gaps that remain. The research project culminates in a policy blueprint that ensures not only that today's investments offer the maximum returns, but also that the human infrastructure of broadband is future ready.

# CONNECTION IS MORE THAN WIRES: WHY BROADBAND REQUIRES A HUMAN INFRASTRUCTURE

Like the printing press, the telegraph, the railroad, and other consequential technological leaps that came before, the internet has gone from being a disruptive technology to becoming an essential infrastructure of modern life.<sup>4</sup> Whether it is looking for a job or keeping in touch with family, the ability to access and make use of broadband is a core determinant of a person's ability to fully participate and advance in society. Yet the extent to which broadband infrastructure, and digital technologies in general, are now a given part of most communities obscures the profound amount of work it has taken to build the physical infrastructure and integrate it into workplaces, schools, and homes. Billions of dollars have been spent—by telecommunications companies and the government—to build and upgrade broadband networks across the nation. Millions of people have learned new skills, including how to use computers and other digital devices, and how to navigate the internet, avoid scams, and protect their digital privacy. Building and maintaining these broadband networks and learning and updating skills will need to be an ongoing effort as technology continues to evolve.

The disparities in how internet technologies have been adopted across American society often map onto entrenched demographic disparities. As early as the mid-1990s, the National Telecommunications and Information Administration (NTIA) observed that while “low-income, minority, young, and less educated computer households in rural areas and central cities” were among the most enthusiastic users of online services, they fell behind the nation when it came to home computer and modem penetration.<sup>5</sup>

The most recent statistics from NTIA have shown significant growth, with 83 percent of people ages three and older in the United States having used the internet in some fashion in 2023.<sup>6</sup> But low-income households as well as racial and ethnic minorities—such as Black Americans, American Indians, Alaska Natives, and Hispanics—continue to lag behind other demographic groups in terms of internet use.<sup>7</sup> In recognition of the fact that certain demographics have faced and continue to face structural barriers to connectivity,<sup>8</sup> the Digital Equity Act of 2021 specifically prioritizes initiatives that benefit eight covered populations, including low-income households, older adults, veterans, individuals with disabilities, people with English-language barriers, racial and ethnic minority groups, rural residents, and the

incarcerated.<sup>9</sup> In other words, NTIA’s mission to achieve “internet for all”<sup>10</sup> is aligned with broader efforts to ensure equal access to opportunity for those often left behind.

The “human infrastructure of broadband” helps people—including, but not limited to, traditionally marginalized groups—access and make meaningful use of broadband. Whether a librarian helping a veteran fill out an online benefits application at a public computer, a digital navigator assisting a senior citizen in signing up for affordable home broadband, a digital skills trainer teaching social media privacy in Spanish, or a device refurbisher helping students find devices to use at home—all comprise the human infrastructure of broadband.

The term “infrastructure” underlines that the work of these librarians, digital navigators, digital skills trainers, device refurbishers, and others is *foundational*. Infrastructure is made up of “objects that create the grounds on which other objects operate, and when they do so they operate as systems.”<sup>11</sup> Roads, for instance, allow for the movement of goods, and, as they interconnect, they operate in a network or system. The work of connecting people to devices, broadband service, and skills is the undergirding that will allow a digital society and economy to flourish and benefit us all.

Like other infrastructure, the human infrastructure of broadband does not operate in isolation but is *part of a larger digital inclusion ecosystem*—the wider “combination of programs and policies that meet a geographic community’s unique and diverse [connectivity] needs,” including the entities working together in that place “to address all aspects of the digital divide, including affordable broadband, devices, and skills.”<sup>12</sup> That is, the digital inclusion ecosystem of any particular locale (e.g., a city or state) includes the interactive (person-to-person) support work of the human infrastructure of broadband and the physical infrastructure and relevant policies. An ecosystem view also considers the overall interplay of these structural resources and the sum total of the efforts of a wide variety of actors and organizations. Thus, the human infrastructure of broadband is a vital part of a digital inclusion ecosystem.

This work, of making physical infrastructure usable and useful to people, is *profoundly human*. From helping people evaluate their options for broadband service and devices to understanding what they can learn to do requires direct interaction. These interactions require patience to explain (and perhaps explain again) how to do something that may have become second nature to many of us—and the humility to know that evolving technologies can leave us behind too.

Demonstrating someone’s eligibility for a subsidized broadband program or troubleshooting their devices does not require just technical and bureaucratic skills; it also has a deeply affective component. People may feel shame, fear, and anxiety about what they do not know, yet also excitement and pride about new skills and opportunities.<sup>13</sup> Digital navigators



stress the importance of empathy, patience, cross-cultural sensitivity, and strong interpersonal skills in their jobs. Trust, borne of these interpersonal skills, is key. As another study on digital navigation services noted:<sup>14</sup>

Trust is paramount. One in three [survey] respondents had already worked with the organization providing digital navigator services on other matters. And nearly three-quarters first learned of the digital navigator program through trusted sources such as family, friends, or an organization's staff members.

Conceptually, the human infrastructure of broadband builds on, and is related to, the concepts of **meaningful broadband adoption**,<sup>15</sup> **community infrastructure**,<sup>16</sup> and **social infrastructure**.<sup>17</sup> Meaningful broadband adoption refers to “an ecology of support—institutions, organizations, and even informal groups that serve to welcome new users into broadband worlds.”<sup>18</sup> Gangadharan and Byrum also specify that the “meaningful” here is defined by the users themselves, not by top-down ideas of how people should use technology. Community infrastructure “includes residents, activists, community development corporations, social service organizations, affordable housing developments, faith institutions, business owners, and schools working together and independently to address poverty and racism.”<sup>19</sup>

Formal and informal networks of actors work together to help people connect to and use broadband, many—though not all—with the explicit goal of tackling digital inequities. Social infrastructure, in turn, refers to “the physical places and organizations that shape the way people interact.” Notably, “when social infrastructure is robust it fosters contact, mutual support, and collaboration among friends and neighbors.”<sup>20</sup>

## WHAT'S IN A NAME? Digital Navigation and the Human Infrastructure of Broadband

“Digital navigation” is a widely used term to describe helping people connect to and use broadband. The National Digital Inclusion Alliance (NDIA), a key partner in this research, has been instrumental in propagating digital navigation as a concept. Following the outset of the COVID-19 pandemic, NDIA worked with the Rural Local Initiatives Support Corporation (LISC) and the Salt Lake City Public Library to develop a pilot Digital Navigator program. That pilot expanded to become NDIA's National Digital Navigator Corps that placed navigators in 18 rural and tribal communities. The organization also runs a digital navigator working group, which has developed and shared programmatic resources that can be used by other organizations.

Digital navigation relies on person-to-person interactions in which “digital navigators” aid people with connectivity challenges. According to NDIA, digital navigators are “trusted guides who assist community members with ongoing, individualized support for accessing affordable and appropriate connectivity, devices, and digital skills.”<sup>21</sup> Thus, digital navigators may help people get internet service (e.g., signing up for affordable home broadband via the Affordable Connectivity Program or Lifeline), secure a device (e.g., obtaining a refurbished PC or low-cost laptop or tablet), and/or learn digital skills (e.g., setting up an email account or finding a

Similarly, the human infrastructure of broadband works in the context of pre-existing organizations whose purpose lies in supporting and building communities. This includes libraries, nonprofits, government agencies, and other groups that serve their communities in ways beyond facilitating broadband access, but now find that digital connectivity and digital skills building are essential to achieving their wider goals. Ultimately, while broadband technology is a disruptive and transformative force, its integration into our society is highly interlinked with existing social challenges and human support systems.

**INVESTMENTS AND RESEARCH HAVE PRIVILEGED THE WIRES AND POLES OF BROADBAND INFRASTRUCTURE WITHOUT ACCOUNTING FOR OR MAKING EXPLICIT THE HUMAN INFRASTRUCTURE NEEDED TO ENABLE DIGITAL OPPORTUNITY.**

The human infrastructure of broadband is the necessary social and relational complement to the work of building physical infrastructure. The large majority of the immense Infrastructure Investment and Jobs Act investment in broadband is focused on building physical networks where people are unconnected or insufficiently connected. Investments and research have privileged the wires and poles of broadband infrastructure without accounting for or making explicit the

human infrastructure needed to enable digital opportunity. But fiber-optic cables may just be glass in the ground if people cannot subscribe to and use high-speed internet access.

library class or online resources to learn additional skills). The NDIA definition of digital navigation emphasizes one-on-one, repeated engagements with community members, tailoring support to people's particular needs. Other researchers have also described the approach as an "ongoing and holistic commitment."<sup>22</sup>

However, the term "digital navigation" is used far more broadly and loosely. In part, our research emerged from the recognition that although digital navigation offers an "ideal, comprehensive model," in practice, most organizations can only implement portions of this broad approach.<sup>23</sup> The term "digital navigator" is used to refer not only to those who provide direct, ongoing digital inclusion support but also to program models in which one person trains others on how to help individuals connect, as well as people who lead digital skills classes at libraries. Other terms also may be used. As one of our survey respondents noted, "In our work, we hear 'digital ambassadors,' 'coaches,' 'connectors,' and 'navigators' used interchangeably. Really [it] depends on the scope of the work, which term most accurately depicts the activities taking place." The impetus for this research project was to describe this work with greater precision in order to understand how to support its various streams going forward.

## LOOKING BACK:

# TRACING the HISTORY of the HUMAN INFRASTRUCTURE of BROADBAND

How do we talk about the gap between those who are digitally connected and those who are not, as well as what it takes to bridge that digital divide?

In the past three decades, several different terms have been used—sometimes simultaneously—to either define the problems (digital divide or digital discrimination), the methods (digital inclusion or digital navigation), or the goal (universal access or digital equity) of making broadband ubiquitous, usable, and used. The web of actors using these terms and grappling with these issues has included national, state, and local governments and policymakers, community institutions like libraries, community centers, and schools, telecommunications and technology companies, researchers, nonprofits, philanthropies, and public interest groups.

Tracing the history from access to telephone services in the 1970s to the post-pandemic investment in broadband and digital equity is inevitably a complex endeavor. In this section, we offer a brief portrait of the thinking and action around the challenge of integrating a powerful—and ever-evolving—set of technologies into our society.

## 1970s–1990s: Universal Access and the Digital Divide

The question of who is technologically unconnected or underconnected long predates the widespread emergence of computers and the internet. In a review of the past 50 years of TPRC, a leading conference on telecommunications policy, Prabir Neogi notes that universal access to basic services at an affordable cost has been an important telecommunications policy issue since the advent of the conference in 1972.<sup>24</sup> The concept of universal access and service dates back even further as a communications infrastructure goal, with its roots in postal<sup>25</sup> and telephone<sup>26</sup> service. While technology has evolved in significant ways since the 1970s (achieving the goal of universal service used to mean providing access to a landline phone), the basic concern remains—due, in part, to entrenched social inequalities. In other

words, the challenge of achieving universal access to the communications infrastructure of the day (e.g., mail service, telephone service, dial-up internet, high-speed broadband) “persists over time because the goalposts shift; the definition of Universal Access is broadened due to technological progress and changing societal needs and expectations.”<sup>27</sup>

With computers and the internet becoming more widely used in the 1990s, observers recognized that there was (and still is) a so-called **digital divide** between people who have access to the internet and those who don't.<sup>28</sup> The Telecommunications Act of 1996 expanded and formalized the Universal Service program to include both telecommunications and advanced services.<sup>29</sup>

In response, community organizations help facilitate access to and use of the internet and digital tools. Public libraries in the United States began widely offering internet-enabled public-access computers in the 1990s and helped people learn how to use them.<sup>30</sup> Simultaneously, members of the **community network movement** established community networks (Free-Nets) and sought federal and foundation grants to create community-based computer centers and training programs.<sup>31</sup> The human infrastructure of broadband (in this case, **community technology centers**, or CTCs, including libraries) was central to bridging the digital divide.<sup>32</sup> **Community broadband and wireless networks** also emerged, whereby community groups worked to provide internet infrastructure where there was none or to make free or low-cost broadband options available.<sup>33</sup>

From the coining of the term “digital divide,” federal funding and policy interventions have been key to addressing digital inequities. For example, from 1994 to 2005, the National Telecommunication and Information Administration's (NTIA) Technology Opportunities Program (TOP) provided a critical source of federal funding for innovative applications of internet infrastructure. The program ultimately awarded \$230 million to the public and nonprofit sectors for projects such as telemedicine in daycare settings, providing tribal children with access to online educational resources, and developing secure networks to help victims of domestic abuse obtain court-ordered protection and access to legal services.<sup>34</sup>

## EARLY 2000s: A More Nuanced View

Initial efforts to address the digital divide were often focused on providing public access by building networks or technology centers, but the discourse evolved over time to include a more complex understanding of technology adoption and use. More recent thinking suggests that we should consider first-, second-, and third-level digital divides. That is, to fully participate in a digital society, people must have access to networks and devices (first level). Yet simply having access to the technology does not make all things equal. People

must also have digital skills and literacy (second level), and be able to leverage these skills and tools to achieve desired uses and outcomes (third level).<sup>35</sup> To capture these nuances, new discourses emerged in the early 2000s to include an increasing focus on digital literacy, digital inequality, and digital inclusion. While these terms are used in a variety of ways, **digital literacy** generally refers to the “skills and abilities needed to take advantage of the internet once access is available.”<sup>36</sup> This understanding of digital literacy includes the ability to use technology “to find, evaluate, organize, create, and communicate information” as well as the skills necessary for “digital citizenship and the responsible use of technology.”<sup>37</sup> **Digital inequality** refers to the disparities between people who have internet access and those who don’t.<sup>38</sup> And **digital inclusion**<sup>39</sup> more typically focuses on the policies implemented to “close the digital divide and promote digital literacy.”<sup>40</sup>

Later years in this decade were characterized by the Great Recession, which resulted in a greater need for public-access computing centers as people lost work, needed to save money, and applied for benefits and new jobs online.<sup>41</sup> There was also a significant uptick in demand for upskilling at this time at libraries and elsewhere. People canceled their internet subscriptions when they lost work, and many needed to gain skills to find new work. In this context, the U.S. federal government provided \$4 billion in stimulus funds, including grants for broadband infrastructure, public computer centers, and broadband adoption, through the Broadband Technology Opportunities Program (BTOP).<sup>42</sup> Importantly, a portion of the NTIA’s BTOP grants aimed to encourage **sustainable broadband adoption** in recognition of the fact that training, equipment, and support are necessary to ensure the consistent use of broadband, especially among populations where broadband technology has traditionally been underused.<sup>43</sup>

The establishment of BTOP was followed by the 2010 release of the National Broadband Plan, which provided a comprehensive strategy for improving internet access and use in the United States.<sup>44</sup> While this era continued to highlight the importance of public-access computer centers, a greater focus was put on encouraging **home broadband**. Libraries began lending internet hotspots for home use, with both federal<sup>45</sup> and philanthropic<sup>46</sup> support.

Researchers began identifying possible barriers to universal home broadband, including whether broadband service was available, whether it was affordable, whether people had the skills to make use of it, and whether they considered it relevant to their lives.<sup>47</sup> Research across a diverse range of low-income communities revealed the complex relationship between non-adoption, adoption, and “un-adoption” (reasons people might have home broadband service but then disconnect), as well as the critical role libraries and other community organizations play in both facilitating connectivity and shoring up gaps in skills and access.<sup>48</sup>

In addition to the attention to barriers, practitioners also noted that a study of **meaningful broadband adoption** must seek to understand social contexts and how they may impact

access to, use of, and comfort with broadband, as well as the ecology of support that helps “welcome new users into broadband worlds.”<sup>49</sup> This holistic approach also built on earlier work, which emphasizes that although people may not be viewed as digitally included, they may still be highly aware of digital technology and how it impacts their lives—often in negative ways, such as through surveillance.<sup>50</sup>

## 2020–PRESENT: Digital Navigation and Digital Equity

As noted in the introduction, the COVID-19 pandemic accelerated activity to help people get online.<sup>51</sup> The term **digital navigation** was introduced by the National Digital Inclusion Alliance (NDIA) and related practitioners, including libraries, as a way to refer to efforts to support home broadband subscription, device access, related tech support, and digital literacy.<sup>52</sup> Researchers link the digital navigator model to the role of “health navigators” who assisted people with enrolling in the Affordable Care Act more than 10 years ago.<sup>53</sup>

Several waves of emergency federal grants to states and libraries helped fund digital inclusion programs and digital navigators on a temporary basis. Projects ranged from deployment of teams of digital navigators to serve an urban area<sup>54</sup> to small grants enabling libraries to offer hotspots and laptops for loan. The Emergency Connectivity Fund helped schools and libraries provide the tools for remote learning to their communities.<sup>55</sup> Many organizations also worked to help people sign up for individual subsidies such as the Emergency Broadband Benefit and the Affordable Connectivity Program (ACP), which temporarily helped more than 23 million households get affordable home broadband.<sup>56</sup> This activity coincided with an increased national-level focus on diversity, equity, and inclusion, leading people—including digital inclusion practitioners and the public sector<sup>57</sup>—to consider broadband adoption from an **equity** perspective as well. Digital equity, which had previously been used as a term in the K-12 education space, was expanded to refer to the wider goal of ensuring that “all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy.”<sup>58</sup> The Infrastructure Investment and Jobs Act formalized this definition of digital equity through the Digital Equity Act of 2021.<sup>59</sup>

# LOOKING AROUND: MAPPING the HUMAN INFRASTRUCTURE of BROADBAND

## METHODOLOGY

The Benton Institute for Broadband & Society led this research project in close collaboration with a research advisory committee of prominent leaders and researchers in the field:

- **Larra Clark**, American Library Association
- **Colin Rhinesmith**, Digital Equity Research Center, Metropolitan New York Library Council
- **Caroline Stratton**, National Digital Inclusion Alliance

The advisory committee provided critical input to research design and development of the taxonomy and policy recommendations.

The research team worked collaboratively with organizations including NDIA and its Digital Navigator Working Group, the Public Library Association (a division of the American Library Association), and Lead for America's American Connection Corps to circulate surveys and build a database of more than 250 programs that are working to get people online, provide devices, and teach the skills necessary to use the internet. This database is not exhaustive but covers a wide range of programs from diverse geographies.

The database is crucial for understanding the breadth of the human infrastructure of broadband, making visible a slew of activities happening around the country to help people connect to and use the internet. The database also offers a structured view into over 250 programs, helping to understand who these organizations aim to serve, the support they provide, how they are funded, and how they are staffed. By making it possible to look across a wide range of programs, the database helps identify patterns—what kinds of services are usually provided together, what kinds of organizations seem to provide which services—and highlights potential gaps. The resulting taxonomy categorizes the wide breadth of work in order to facilitate informed program design and policymaking.

# LANDSCAPE ASSESSMENT

We focused the preliminary analysis of the database on delineating the different types of services, organizations, and modes of providing services.

## HUMAN INFRASTRUCTURE of BROADBAND SERVICE PROVIDERS

The nature of any given program’s institutional home impacts how these organizations are staffed and structured, the kinds of funding they can access, and their existing focus or expertise. Organizations that run the projects—nonprofits, government agencies, and other community anchor institutions—map roughly onto the list of “eligible entities” defined by the Digital Equity Act as eligible to receive funding.

However, the eligible entity categories are not discrete. Organizations can and do fall into more than one category. NTIA’s definition of community anchor institutions, for instance, is expansive and can include other eligible entities. While the list of eligible entities includes nonprofit organizations, “community anchor institutions” can refer to public housing, public schools, libraries, and “any other nonprofit or governmental community support organization.” Community anchor institutions can also include healthcare providers, which may also be nonprofits. Libraries may be also be a city or county/parish department, a nonprofit, or an independent library district.

In an effort to understand the frontline workers who comprise the human infrastructure of broadband, the survey asked respondents about the people who staffed digital navigation or similar digital support services. As Table 1 shows, by far the most common response was for existing staff to take on additional responsibilities. Recent research about digital navigation in libraries echoed these survey findings. Only 12.1 percent had staff who were dedicated digital navigators,<sup>60</sup> and many digital navigator positions are part-time.<sup>61</sup>

## ELIGIBLE ENTITIES for DEA COMPETITIVE GRANTS

- POLITICAL SUBDIVISIONS, AGENCIES, or INSTRUMENTALITIES of the STATE, including PUBLIC HOUSING;
- INDIAN TRIBES, ALASKA NATIVE ENTITIES, and NATIVE HAWAIIAN ENTITIES;
- FOUNDATIONS, CORPORATIONS, INSTITUTIONS, and ASSOCIATIONS that are NOT FOR PROFIT and also NOT SCHOOLS;
- COMMUNITY ANCHOR INSTITUTIONS;
- LOCAL EDUCATION AGENCIES;
- WORKFORCE DEVELOPMENT PROGRAMS; and
- PARTNERSHIPS BETWEEN ANY OF THE ABOVE ENTITIES and AN ENTITY DEEMED TO BE WITHIN THE PUBLIC INTEREST by the [NTIA] THAT IS NOT A SCHOOL.



Table 1: **STAFFING DIGITAL NAVIGATION SERVICES**

<b>SOME OF OUR EXISTING STAFF HAVE TAKEN ON THIS WORK AS PART OF THEIR RESPONSIBILITIES</b>	<b>80</b>
<b>WE HAVE HIRED FULL-TIME STAFF TO DO THIS WORK</b>	<b>33</b>
<b>WE HAVE HIRED PART-TIME STAFF TO DO THIS WORK</b>	<b>32</b>
<b>WE WORK WITH ANOTHER ORG OR PROGRAM (like THE AMERICAN CONNECTION CORPS) THAT PROVIDES STAFF</b>	<b>31</b>
<b>WE RECRUITED VOLUNTEERS TO DO THIS WORK</b>	<b>24</b>

**NOTE:** Respondents could choose more than one option.

The Digital Navigator Toolkit,<sup>62</sup> developed by NDIA and the Salt Lake City Library, describes the work as more social service than technical service. Navigators need to have some comfort with technology and be able to conduct internet research on behalf of a community member, but these positions do not require extensive technical training. Instead, empathy and trust between a navigator and their client is far more important, because although training can be brief, providing direct service can be time-consuming. Projects in the database, and those documented by other research,<sup>63</sup> have a range of configurations in how they provided services, from quick question-and-answer interactions to development of long-term relationships with clients. The majority of projects in the database offer services in person, and the majority use the “office hours” (or help desk) model in which people can drop by for help. A significant number of projects in the database also reported sending staff to where people are, other community organizations or spaces, or even people’s homes to provide direct services.

**HIB SERVICES PROVIDED**

The survey asked respondents what services they provided in some detail, differentiating between programs that help people get devices versus those that help repair and troubleshoot those devices. Table 2 below presents this data and groups services under three overarching workstreams that map onto the “three-legged stool” of digital inclusion, described by Digital Charlotte.<sup>64</sup>



- **Help people build digital skills:** Most of the programs in the database provide some digital skills training (230). This includes both help with basic internet skills such as using email and understanding online safety and privacy, and training for advanced skills such as coding and using specific portals like telehealth platforms. For projects that indicated that they provide digital skills training, the survey asked them to list the topics they covered. Only 14 focused on privacy and cybersecurity, teaching people how to identify scams, use password managers, or protect their devices from viruses.
- **Connect people to a broadband service:** These projects either provide broadband service (in a public setting, such as a library computer lab), through a community Wi-Fi network or hotspot loan, or help subscribers enroll in affordable internet programs. More than 210 organizations in the database connect people to broadband service. Most commonly, organizations helped people sign up for the Affordable Connectivity Program (ACP), the federal subsidy program that defrayed the cost of broadband subscription for low-income households until it expired in May 2024. ACP enrollment was a multistep process, whereby the onus to establish program eligibility was on participants.<sup>65</sup> The direct support to help people navigate that administrative process was critical to the program's success, which alleviated the cost of broadband for more than 23 million households at its close.
- **Provide access to devices and tech support:** 192 organizations in the database help people access and maintain access to appropriate devices. The services include device refurbishment programs that provide low-cost or free devices and offer troubleshooting and tech support to keep those devices working.

Most of the organizations in our database provide more than one of the above services. A large number of organizations—more than 150—provide all three of these services.

Table 2: **SERVICES PROVIDED**

<b>HELP PEOPLE BUILD DIGITAL SKILLS</b>	<b>230</b>
<b>ACQUIRE DIGITAL SKILLS</b>	<b>207</b>
<b>NAVIGATE SPECIALIZED PORTALS</b> (for example, FOR HEALTH CARE or GOVERNMENT PROGRAMS)	<b>89</b>
<b>PROMOTE PRIVACY and CYBERSECURITY</b>	<b>14</b>
<b>CONNECT PEOPLE to BROADBAND SERVICES</b>	<b>212</b>
<b>ENROLL IN BROADBAND AFFORDABILITY PROGRAMS</b> (e.g., AFFORDABLE CONNECTIVITY PROGRAM sign-up support)	<b>150</b>
<b>PROVIDE PUBLIC ACCESS COMPUTERS or FREE WI-FI ACCESS</b>	<b>125</b>
<b>HELP PEOPLE ESTABLISH or MAINTAIN NETWORKS</b>	<b>24</b>
<b>PROVIDE ACCESS to DEVICES and DEVICE MAINTENANCE</b>	<b>192</b>
<b>PROMOTE DEVICE OWNERSHIP</b>	<b>107</b>
<b>OFFER TECH SUPPORT/TROUBLESHOOTING</b>	<b>135</b>

**NOTE:** A majority of projects offer multiple services.

## POPULATIONS SERVED

The Digital Equity Act identified eight population groups, or “covered populations”, that are most impacted by the digital divide.<sup>66</sup> Programs funded by that law should focus on these specific vulnerable communities. Table 3 shows the number of projects in the database focused on specific covered populations.

Table 3: **POPULATIONS SERVED** (by covered populations)

<b>INDIVIDUALS WHO LIVE in LOW-INCOME HOUSEHOLDS</b>	<b>128</b>
<b>AGING INDIVIDUALS</b>	<b>111</b>
<b>RACIAL and ETHNIC MINORITIES</b>	<b>107</b>
<b>INDIVIDUALS with A LANGUAGE BARRIER, including INDIVIDUALS WHO are ENGLISH LEARNERS or WHO HAVE LOW LEVELS of LITERACY</b>	<b>99</b>
<b>INDIVIDUALS with DISABILITIES</b>	<b>98</b>
<b>VETERANS</b>	<b>92</b>
<b>RURAL INHABITANTS</b>	<b>83</b>
<b>INCARCERATED INDIVIDUALS</b>	<b>40</b>
<b>ALL COVERED POPULATIONS</b>	<b>46</b>

Most projects had a broad mandate to serve all community members or multiple covered populations. A smaller number of programs were tailored for specific populations—most notably veterans, those with disabilities, incarcerated people, tribal populations, and individuals with a language barrier—likely because serving these groups required more tailored resources and expertise.

# THE TAXONOMY of the HUMAN INFRASTRUCTURE of BROADBAND

Across the three dimensions of service providers, services provided, and populations served, the preliminary analysis of the database reveals the interrelated and overlapping nature of the human infrastructure of broadband. Organizations cannot be categorized as a single type of entity and often work in partnerships. Most projects offer more than one service and aim

to serve a range of groups. The meaningful distinction between projects that emerge from this landscape assessment is that of mission: *Is digital equity their core goal or a complementary goal?*

**THE INFRASTRUCTURE INVESTMENT AND JOBS ACT DEFINES “DIGITAL EQUITY” AS “THE CONDITION IN WHICH INDIVIDUALS AND COMMUNITIES HAVE THE INFORMATION TECHNOLOGY CAPACITY THAT IS NEEDED FOR FULL PARTICIPATION IN THE SOCIETY AND ECONOMY OF THE UNITED STATES.”**

The Human Infrastructure of Broadband database found projects that either are centrally concerned with digital equity in and of itself or focus on digital equity because it is instrumental to achieving broader social goals. The two program models, **core** and **complementary**, categorize projects according to this difference in mission. Additionally, the database includes projects in which multiple organizations partner together. The **coalition** program model may not provide direct services but helps coordinate work, pool resources, and leverage collective capacity, particularly to coordinate and advocate for their members. The organizations that make up a coalition may be classified as core or complementary, but assembled together, they focus on digital equity.

Figure 1: **TAXONOMY OF HUMAN INFRASTRUCTURE OF BROADBAND**

CORE	COMPLEMENTARY	COALITION
<p>Organizations for whom digital equity is the center of their work.</p> <p>Nonprofits focused first and foremost on digital equity.</p> <p>Libraries, because their core mission is information services.</p>	<p>Organizations that have a wider mission and added digital equity work because it helps the mission or people they serve.</p> <p>Health, education, and housing agencies</p> <p>Tribal Entities</p> <p>Nonprofits with broader missions</p>	<p>Primarily a coordinating role. Individually, the organizations that make up the coalition may be Core or Complementary, but they are working together with a focus on digital equity.</p>

The Human Infrastructure of Broadband taxonomy helps clarify the comparative advantages and limitations of different program models. Coalitions, for instance, can be particularly effective at advocacy and shaping a policy agenda. For example, layering digital skills onto existing financial literacy training can leverage the existing client base of an organization, but that skills training may not address a learner’s needs. The categorization can also help identify funding avenues beyond the Digital Equity Act. For instance, the Department of Housing and Urban Development could continue support for projects led by affordable-housing agencies. Each of the three program models has subtypes of projects and organizations, which are described below.

## CORE — Organizations with Digital Equity at Their Core

Nonprofits that are focused on digital equity, including libraries (because their mission is access to information and technology), fall under the core program model.

### LIBRARIES, the ORIGINAL DIGITAL NAVIGATORS

#### **THE 2023 PUBLIC LIBRARY TECHNOLOGY SURVEY FOUND THAT:**

**99.4% of PUBLIC  
LIBRARIES OFFER  
WI-FI INTERNET  
ACCESS to PATRONS.**

**95% of PUBLIC  
LIBRARIES OFFER  
SOME KIND of  
FORMAL or INFORMAL  
DIGITAL LITERACY  
TRAINING.**

**47% of LIBRARIES  
LEND HOTSPOTS,  
LAPTOPS, or OTHER  
DEVICES.**

**29.7% of LIBRARIES  
OFFER a DIGITAL  
NAVIGATOR  
PROGRAM.**

There are nearly 17,000 public library locations across the United States—from the biggest cities to even the most remote locations. Libraries are critical and long-serving members of digital inclusion ecosystems. They have long provided access to the internet, computers and other connected devices, one-on-one assistance, and classes to meet community digital literacy needs. Notably, researchers found that “public libraries were the only public source of free internet access in their communities in the first decade of this century.”<sup>67</sup>

While public libraries typically offer technology-related services to the whole community, they may also offer digital inclusion programs aimed at supporting specific populations such as families, older adults, small-business owners, and formerly incarcerated individuals.

Some libraries have established or reorganized services to be formal library-led digital navigator programs. Urban libraries such as Salt Lake City Public Library,<sup>68</sup> Multnomah County Library,<sup>69</sup> and the King County Library System<sup>70</sup> have offered digital navigation programs, using available resources to employ a coordinated team of digital navigators (either librarians or other community members). In rural areas as well, libraries are

offering digital navigation services. Five rural Oklahoma libraries have worked in partnership with Oklahoma State University and AARP Oklahoma to provide digital navigation services.<sup>71</sup> Several state libraries, including Arizona,<sup>72</sup> California,<sup>73</sup> Connecticut,<sup>74</sup> Hawaii,<sup>75</sup> New Jersey,<sup>76</sup> and Texas,<sup>77</sup> have established programs through which they have offered training, grants, and other assistance to local libraries that wish to establish formal digital navigation efforts.

Libraries possess core resources and advantages that make them an essential component of the human infrastructure of broadband:

- Libraries are everywhere and welcome everyone.
- Libraries usually have existing community partnerships and centrally located buildings.
- Libraries are a trusted and visible community resource where many people already go for help with technology questions and challenges.
- Libraries have a long history of digital inclusion work.
- Libraries have technology resources, including Wi-Fi access, devices to use and borrow, and digital literacy trainings.

However, libraries also face increased demands with stagnant or reduced funding and staffing. Federal funds account for less than one percent of library funding, the vast majority of which is local. Federal funding is important to library technology needs. More than half (52 percent) of libraries have applied for the E-Rate subsidy to offset the costs of internet access.<sup>78</sup> The majority of libraries (61.9 percent) rely on grants to meet their technology needs.<sup>79</sup> Once the investment in digital equity through the Infrastructure Investment and Jobs Act expires, libraries may face even greater demand as other avenues lose funding.

## **DIGITAL EQUITY-FOCUSED NONPROFITS**

Digital equity-focused nonprofits include a wide range of organizations. The database includes national and regional nonprofits working across multiple states, in addition to locally focused organizations. For example, the Nonprofit Tech Readiness (NTEN) Tech Squad works with senior populations, refugees, and families to provide digital skills, devices, and other support in Omaha, Charlotte, San Antonio, Kansas City, Cleveland, and other locations. On a more local level, the Center for Digital Equity, based in Charlotte, North Carolina, serves just Mecklenburg County. National and regional organizations offer the opportunity to pool certain resources, such as establishing a device-refurbishing ecosystem or developing digital skills curricula. More locally focused organizations offer community presence, which can be critical in reaching vulnerable community members.

Some of these nonprofits provide a single service. For instance, Project Waves in Baltimore works to improve internet access by offering a community wireless network through which households can connect to free, high-speed home internet service. Other organizations may begin with a narrow focus, like device distribution, but later add other digital equity programming to their repertoire. Organizations like Tech Exchange in the San Francisco Bay Area and the Kramden Institute in Durham, North Carolina, started as refurbishers and distributors of donated devices and now also offer digital skills training and other digital equity programming.

## COMPLEMENTARY — Integrating Digital Equity into Other Support and Services

**BECAUSE  
COMPLEMENTARY  
PROGRAM MODELS  
CONNECT THE HUMAN  
INFRASTRUCTURE  
OF BROADBAND TO  
BROADER SOCIAL  
GOALS, THEY CAN  
HELP DEMONSTRATE  
THE BROADER  
OUTCOMES OF  
THE CURRENT  
INVESTMENT IN  
DIGITAL EQUITY.**

The complementary program model includes organizations that have a broader mission, but striving for digital equity also advances their goals. The widespread proliferation of online information and services has meant that most other services and sectors, from banking to accessing government programs, have some need to offer digital support services to their clients. Because complementary program models connect the human infrastructure of broadband to broader social goals, they can help demonstrate the broader outcomes of the current investment in digital equity.

### HEALTH, EDUCATION, and HOUSING AGENCIES

**Health, education, and housing agencies** deliver essential services to their communities but frequently add a layer of digital support services.

Affordable-housing agencies, for example, may see internet service as a critical utility like heat or water and provide free or subsidized access to broadband. They may also recognize that access to the internet, devices, and digital skills can play a role in the empowerment of their residents, which may ultimately help them to move beyond affordable-housing programs. The Department of Housing and Urban Development launched the ConnectHomeUSA program in 2015 to address the “homework gap” for K-12 students who lived in public housing and lacked a reliable internet connection to do schoolwork. By 2020, the program expanded to 100 cities and had connected an estimated 72,500 previously unconnected families to the internet.<sup>80</sup>

Housing agencies are building on broadband connectivity to provide additional digital inclusion services. The Housing Authority of the City of Austin (HACA) has established



“Digital Ambassadors” who are HACA residents who provide training to other residents and advocate for HACA residents’ digital equity needs.

**LIBRARIES, EDUCATIONAL INSTITUTIONS, HEALTH CARE PROVIDERS, AND PUBLIC HOUSING AGENCIES HAVE ESTABLISHED RELATIONSHIPS WITH COMMUNITY MEMBERS AND ORGANIZATIONAL RESOURCES THAT CAN REDUCE THE BURDEN OF ADDING NEW PROGRAMMING.**

Like libraries, educational institutions, health care providers, and public housing agencies are physically in their communities. They have established relationships with community members, often serve as critical partners in community development initiatives, and have organizational resources like meeting spaces and payroll systems that can reduce the burden of adding new programming.

Health, education, and housing agencies in the Human Infrastructure of Broadband database often layered digital inclusion work onto the existing services in partnership with digital equity groups. For instance, Common Sense Media and the Digital Equity Institute worked with Arizona State University’s call center, which has more than 100 phone specialists, to enroll people in the Affordable Connectivity Program. The NTIA’s Connecting Minority Communities Pilot Program is working with Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs),

and Minority-Serving Institutions (MSIs) to improve broadband access and provide digital literacy skills for students as well as community members. In these examples, educational institutions provide broad support for a variety of stakeholders, like students and local residents.<sup>81</sup>

Some health, education, and housing agencies offer digital navigation in close relation to their primary services. Digital navigation in health settings—such as hospitals and community health organizations—tends to be narrowly focused on helping people access health services specifically. Often this is about helping people use telehealth portals safely and privately to access services or communicate with health care teams. Some health care agency programs are more expansive and aim to ensure that patients have the devices they need through programs like Lifeline or the Affordable Connectivity Program (when it was active).

## **NONPROFITS with BROADER MISSIONS**

Roughly 75 percent of nonprofits in the Human Infrastructure of Broadband database have a primary mission other than digital equity, but digital support services advance their broader mission. For instance, the Community Concepts Finance Corporation in Maine deploys a digital navigator to aid clients with devices and internet safety. This is not the organization’s main aim, but rather a means to further its work on financial literacy and security.

Among the projects in the Human Infrastructure of Broadband database, only nonprofits are focused on a particular covered population versus aiming to serve the general public.

This is true of both digital equity-focused nonprofits and those with broader missions. For instance, Operation Restoration in Louisiana is focused on the needs of women and girls impacted by incarceration. Operation Restoration provides skills training and devices as part of wraparound services ranging from housing and education to employment.

The variety inherent to the nonprofit program model makes it difficult to find a single exemplar, but what all these organizations have in common is their reliance on grant funding. The sustainability of their programming requires philanthropic and government support beyond the current Digital Equity Act funding timeline.

## TRIBAL ENTITIES

Indian Country has some of the poorest connectivity in the United States, and Tribal Nations have taken an increasingly active role in directly providing broadband infrastructure to residents.<sup>82</sup> Many Tribal Nations consider self-sufficiency regarding technical systems—referred to as Network Sovereignty<sup>83</sup>—as a crucial aspect of their overall self-determination. Non-native broadband providers may not understand the nuances of building and maintaining networks on indigenous lands, or how sacred sites might impact the construction of towers or the trenching of fiber. Pandemic relief funds and the Infrastructure Investment and Jobs Act both allocated significant funds specifically to broadband for tribal areas, including the nearly \$3 billion for the Tribal Broadband Connectivity program administered by the NTIA.

The Tribal Entities program model involves a range of actors (Tribal governments, Tribal telecommunications companies, and Tribal libraries) that are working on both the physical and human broadband infrastructures. Hoopa Valley Public Utilities District in California and Gila River Telecommunications Inc. (GRTI) in Arizona are two examples of Tribally owned ISPs working on improving broadband infrastructure access in Indian country. Both see an additional responsibility to their community members to offer digital inclusion services, related to economic opportunity and cultural preservation. Hoopa Valley hosts one of NDIA's National Digital Navigator Corps, and GRTI has launched a Digital Connect Initiative to provide digital skills training and develop culturally appropriate learning resources.

## COALITION —

### Working Collaboratively to Advance Digital Equity

Digital inclusion scholars have long emphasized the work of coalitions to advance healthy digital equity ecosystems, even more so as new coalitions emerged in response to the pandemic.<sup>84</sup> The Digital Equity Act recognizes the importance of these efforts, explicitly allowing funding for coalitions.

Coalitions can bring together a range of nonprofits that provide digital inclusion services, as well as businesses, ISPs, education systems, and other actors. Coalitions allow for shared resources, amplifying reach, and also shared knowledge and the establishment of best practices across their membership and beyond. The Digital Inclusion Alliance of San Antonio, for example, runs a device refurbishing program that leverages its membership to increase

the scale of local device refurbishment. The Digital Equity Learning Network for King County, Washington—which includes community-based organizations as well as public and private institutions—brings its membership together regularly and provides learning resources.

**COALITIONS THEMSELVES—INCLUDING THOSE LED BY NONPROFITS AND LOCAL GOVERNMENTS—OFTEN ARE NOT DIRECT SERVICE PROVIDERS BUT FULFILL A CRITICAL ROLE IN COORDINATING STAKEHOLDERS AND DIRECTING RESOURCES.**

Coalitions themselves—including those led by nonprofits and local governments—often are not direct service providers but fulfill a critical role in coordinating stakeholders and directing resources. City governments are increasingly undertaking digital equity work to better serve their citizens. Cities can provide any direct digital support services and/or fund and partner with a group of local organizations (public libraries, nonprofits) that offer these services. For example, the government of Pima County, Arizona, established an Office of Digital Inclusion that offers digital skills and privacy/online safety classes. Some local governments contract with other organizations to do the direct service work. The City of Philadelphia works

with nonprofit partners to manage a Digital Navigator Network that enrolls people in low-cost broadband plans and helps them access low-cost devices. City and county governments have received direct federal funding and may be well positioned to apply for further federal grants, depending on their size and capacity.<sup>85</sup> The City of Syracuse used American Rescue Plan Act (ARPA) funding to establish a pilot program to provide free broadband internet access to 2,500 low-income households, for instance.

State governments have also established digital navigation programs. For instance, the Colorado Office of the Future of Work hired navigators who primarily help community members find affordable devices, fill out online forms, or apply for benefits. Currently funded by the state legislature, this work will be supported through the NTIA's Digital Equity Capacity Grant Program.

# LOOKING AHEAD

This report is the first piece of a larger research project aimed at strengthening and sustaining the human infrastructure of broadband. A look at the history of digital divide scholarship and digital inclusion work helps contextualize the current moment of investment and activity. The survey and landscape assessment capture the breadth of ongoing work. Delineating and describing the three program models informs actionable insights about how to sustain the human infrastructure of broadband.

To provide concrete examples of core, complementary, and coalition models, we offer 12 case studies that delve deeply into how these program models and their subtypes function, the problems they are best suited to solve or populations they are best suited to reach, and the support they need to succeed. The cases are diverse in terms of sources of funding, geographic location, and tenure in the digital inclusion field. Three of the 12 spotlight coalition approaches, four present the core program model, and five focus on the different subtypes of the complementary program model.

Building on the insights from the case studies, we convened three expert working groups—on free and affordable broadband, device access and maintenance, and digital skills—to reflect on what is currently working and what is needed for the human infrastructure of broadband to thrive. Moving from practice to policy, our multistage, collaborative research project culminated in a convening with policy entrepreneurs. Soon, we will launch a practice-informed, future-focused policy blueprint to sustain the human infrastructure of broadband.

# ENDNOTES

- 1 Laura Robinson, Jeremy Schulz, Aneka Khilnani, Hiroshi Ono, Shelia R. Cotten, Noah McClain, Lloyd Levine, et al, "[Digital Inequalities in Time of Pandemic: COVID-19 Exposure Risk Profiles and New Forms of Vulnerability](#)," *First Monday* 25, no. 7 (2020).
- 2 Colin Rhinesmith and Susan Kennedy, [Growing Healthy Digital Ecosystems during COVID-19 and Beyond](#) (Benton Institute for Broadband & Society, 2020).  
  
Amelia Bryne and Marijke Visser, "[Keeping Communities Connected: Library Broadband Services during the COVID-19 Pandemic](#)," *ALA Policy Perspectives*, no. 9 (2022).
- 3 "[Digital Equity Act Programs](#)" Internet for All, accessed November 27, 2024.
- 4 Tom Wheeler, *From Gutenberg to Google: The History of Our Future* (Brookings Institution Press, 2019).
- 5 [Falling Through the Net: A Survey of the 'Have Nots' in Rural and Urban America](#) (National Telecommunications and Information Administration, 1995).
- 6 Rafi Goldberg, "[New NTIA Data Show 13 Million More Internet Users in the U.S. in 2023 than 2021](#)," National Telecommunications and Information Administration, June 6, 2024.
- 7 Heather King, Michael Martin, Suzanne McArdle, Rafi Goldberg and Bethany DeSalvo, "[New Digital Equity Act Population Viewer Shows Broadband Access and Demographic Characteristics](#)," United States Census Bureau, May 13, 2022.
- 8 "[FCC Adopts Rules to Prevent and Eliminate Digital Discrimination](#)," Federal Communications Commission, November 20, 2023.
- 9 "[Digital Equity Act at a Glance](#)," National Telecommunications and Information Administration, June 26, 2024.
- 10 "[Internet for All: A Whole-Of-Nation Approach to High-Speed Internet](#)," National Telecommunications and Information Administration, accessed November 27, 2024.
- 11 Brian Larkin, "[The Politics and Poetics of Infrastructure](#)," *Annual Review of Anthropology* 42 (2013): 327-43.
- 12 Angela Siefer, "[NDIA Community Defines 'Digital Inclusion Ecosystem'](#)," National Digital Inclusion Alliance, August 27, 2021.
- 13 Norma E. Fernandez, "[From Fear to Confidence: The Digital Skills Journey of Underserved Women](#)," Webinar from Benton Institute for Broadband & Society, April 9, 2024.
- 14 Matt Kalmus, Hannah Hill, Jean Lee, Chris Goodchild, and David Webb, [A Human Approach to Closing the Digital Divide](#) (Boston Consulting Group, 2022).
- 15 Seeta Peña Gangadharan and Greta Byrum, "[Introduction: Defining and Measuring Meaningful Broadband Adoption](#)," *International Journal of Communication* 6 (2012): 2601-2608.
- 16 Lisa J. Servon, *Bridging the Digital Divide: Technology, Community, and Public Policy* (Wiley-Blackwell, 2002).
- 17 Eric Klinenberg, *Palaces for the People: How Social Infrastructure Can Help Fight Inequality, Polarization, and the Decline of Civic Life* (Crown, 2018).
- 18 Gangadharan and Byrum, "Meaningful Broadband Adoption."
- 19 Servon, *Bridging the Digital Divide*.
- 20 Klinenberg, *Palaces for the People*.
- 21 "[Who Are Digital Navigators?](#)" National Digital Inclusion Alliance, accessed November 29, 2024.
- 22 Sharon Strover, Whitney Nelson, and Sheila Lalwani, "[Framing Access: Digital Navigators and Libraries](#)," *Journal of Information Policy* 14 (2024).
- 23 Strover et al, "Framing Access."
- 24 Prabir Neogi, "[Looking Back, Looking Forward: Two Persistent Public Policy Issues and How TPRC Might Help to Address Them](#)," *Journal of Information Policy* 12 (2022).
- 25 "[Universal Service and the Postal Monopoly: A Brief History](#)," United States Postal Service, accessed November 29, 2024.
- 26 "[Universal Service](#)," *Federal Communications Commission*," accessed November 29, 2024.
- 27 Neogi, "Looking Back, Looking Forward."

- 28 National Telecommunications and Information Administration, *Falling Through the Net* (1995).
- 29 “[Universal Service](#),” Federal Communications Commission, accessed November 29, 2024.
- 30 Charles McClure, John, Carlo Bertot, and Douglas Zweigig. [Public Libraries and the Internet: Study Results, Policy Issues, and Recommendations](#) (National Commission on Libraries and Information Science, 1994).
- 31 Sharon Strover, Gary Chapman, and Jody Waters, “[Beyond Community Networking and CTCs: Access, Development, and Public Policy](#),” *Telecommunications Policy* 28, no. 7-8 (2004): 465-485.
- William C. Shuffstall, Theodore R. Alter, Jeffrey C. Bridger, and Sheila S. Sager, “[Connecting Communities: Third Generation Community Network Projects](#),” *Journal of Extension* 45, no. 4 (2007).
- 32 Stephen Davies, Andrew Wiley-Schwartz, Randal D. Pinkett, and Lisa J. Servon, [Community Technology Centers as Catalysts for Community Change: A Report to the Ford Foundation](#), (Ford Foundation, 2003).
- Craig Hayden and Sandra J. Ball-Rokeach, “[Maintaining the Digital Hub: Locating the Community Technology Center in a Communication Infrastructure](#),” *New Media & Society* 9, no. 2 (2007): 235-257.
- Servon, *Bridging the Digital Divide*.
- 33 Catherine A. Middleton, Andrew Clement, and Graham Longford, “[ICT Infrastructure as Public Infrastructure: Exploring the Benefits of Public Wireless Networks](#),” *TPRC 2006* (2006).
- Alison Powell and Sascha D. Meinrath, “[Introduction to the Special Issue: Wireless Networking for Communities, Citizens and the Public Interest](#),” *Journal of Community Informatics* 4, no. 1 (2008).
- 34 [NTIA 2000 Annual Report to Congress](#) (National Telecommunications and Information Administration, 2001).
- Kate Williams, “[Memory and Archives in Community Informatics: Assembling and Using the Records of the U.S. Technology Opportunities Program, 1994-2005](#),” *TOP Bulletin*, November 2007.
- 35 Colin Rhinesmith, Pierrette Renée Dagg, Johannes M. Bauer, Greta Byrum, and Aaron Schill, [Digital Opportunities Compass: Metrics to Monitor, Evaluate, and Guide Broadband and Digital Equity Policy](#), working paper (Merit Network, Inc. and Quello Center, 2023).
- 36 Eszter Hargittai. “[Second-Level Digital Divide: Differences in People’s Online Skills](#),” *First Monday* 7, no. 4 (2002).
- Marijke Visser, “[Digital Literacy and Public Policy through the Library Lens](#),” *Maine Policy Review* 22, no. 1 (2013): 104 -113.
- 37 [United States Code, Title 20 – Education, Chapter 72](#), Museum and Library Services (2018).
- 38 Paul Dimaggio and Eszter Hargittai, “[From the ‘Digital Divide’ to ‘Digital Inequality’: Studying Internet Use as Penetration Increases](#),” Working Paper Series, Princeton University Center for Arts and Cultural Policy Studies, Working Paper #15, Summer 2001.
- 39 [Falling Through the Net: Toward Digital Inclusion. A Report on Americans’ Access to Technology Tools](#), (National Telecommunications and Information Administration, 2000).
- 40 Paul T. Jaeger, John Carlo Bertot, Kim M. Thompson, Sarah M. Katz, and Elizabeth J. DeCoster, “[The Intersection of Public Policy and Public Access: Digital Divides, Digital Literacy, Digital Inclusion, and Public Libraries](#),” *Public Library Quarterly* 31, no. 1 (2012): 1-20.
- Bianca Reisdorf and Colin Rhinesmith, “[Digital Inclusion as a Core Component of Social Inclusion](#),” *Social Inclusion* 8, no. 2 (2020): 132-37.
- 41 Briana Hovendick, “[Libraries and Librarians Feeling Effects of Economic Slowdown](#),” *Library Research Service Fast Facts*, no. 277 (2009).
- 42 “[Broadband Technology Opportunities Program](#),” National Telecommunications and Information Administration, accessed November 29, 2024.
- 43 “[Grants Awarded: Sustainable Broadband Adoption](#),” BTOP/SBI Archived Grant Program, National Telecommunications and Information Administration, accessed November 29, 2024.
- Benjamin Lennett, Joshua Breitbart, and James Losey, [Sustainable Broadband Adoption Application Guide](#), (New America, 2009).
- Robert LaRose, Kurt DeMaagd, Han Ei Chew, Hsin-yi Sandy Tsai, Charles Steinfield, Steven S. Wildman, and Johannes M. Bauer, “[Measuring Sustainable Broadband Adoption: An Innovative Approach to Understanding Broadband Adoption and Use](#),” *International Journal of Communication* 6 (2012): 2576-2600.
- 44 “[National Broadband Plan](#),” Federal Communications Commission, March 17, 2010.
- 45 “[Hotspot Lending: Professor Sharon Strover Wins Grant to Study Rural Library Device-Sharing Programs](#),” University of Texas at Austin, Moody College of Communication, May 3, 2016.

- 46 [“Mayor Bill de Blasio, City Library Chiefs Announce Expansion of Library Hotspot Program Through Google Donation,”](#) New York Public Library, accessed November 29, 2024.
- 47 John Horrigan, [Home Broadband Adoption 2009](#), (Pew Research Center, 2009).
- 48 Dharma Dailey, Amelia Bryne, Alison Powell, Joe Karaganis, and Jaewon Chung, [Broadband Adoption in Low-Income Communities](#), (Social Science Research Council, 2010).
- 49 Gangadharan and Byrum, “Meaningful Broadband Adoption.”
- 50 Lynette Kvasny, [“Cultural \(Re\)Production of Digital Inequality in a US Community Technology Initiative,”](#) *Information, Communication & Society* 9, no. 2 (2006): 160–81.
- Virginia Eubanks, *Digital Dead End: Fighting for Social Justice in the Information Age*, (MIT Press, 2012).
- 51 Zack Quaintance, [“Digital Inclusion Training Programs Increasing Nationwide,”](#) *Government Technology*, April 8, 2022.
- 52 Angela Siefer, [“NDIA Announces Digital Navigator Concept,”](#) National Digital Inclusion Alliance, April 20, 2020.
- Paolo Balboa, Shana Edson, Justin Strange, and Kristi Zappie-Ferradino, [Digital Navigators Toolkit](#) (National Digital Inclusion Alliance, 2021).
- Kalmus et al, *A Human Approach to Closing the Digital Divide*.
- 53 Strover et al, “Framing Access.”
- 54 Balboa et al, *Digital Navigators Toolkit*.
- 55 [“Emergency Connectivity Fund: Helping Schools and Libraries Close the Homework Gap,”](#) Federal Communications Commission, accessed November 29, 2024.
- 56 [“FCC Brings Affordable Connectivity Program to a Close,”](#) Federal Communications Commission, May 31, 2024.
- 57 *Digital Equity Playbook: How City Leaders Can Bridge the Digital Divide*, (National League of Cities, 2021).
- 58 [“The Words Behind Our Work: The Source for Definitions of Digital Inclusion Terms,”](#) National Digital Inclusion Alliance, accessed November 29, 2024.
- 59 Internet for All, “Digital Equity Act Programs.”
- 60 Sarah S. Goek, [2023 Public Library Technology Survey: Summary Report](#), (Public Library Association, 2024).
- 61 [“Connecting Communities with Teleservices: Learning from the Digital Navigators,”](#) Webinar from Urban Libraries Council, April 8, 2021.
- 62 Balboa et al, *Digital Navigators Toolkit*.
- 63 Kalmus et al, *A Human Approach to Closing the Digital Divide*.
- 64 [“What is Digital Inclusion?”](#) The Center for Digital Equity, accessed November 29, 2024.
- 65 Anna Read and Kelly Wert, [“Enrollment Hurdles Limit Uptake for FCC’s Affordable Connectivity Program,”](#) Pew Charitable Trusts, February 28, 2023.
- 66 [“Digital Equity Act at a Glance,”](#) National Telecommunications and Information Administration, June 26, 2024.
- 67 Strover et al, “Framing Access.”
- 68 Kristi Zappie-Ferradino, [“Salt Lake City Public Library Publishes Digital Navigator Toolkit,”](#) National Digital Inclusion Alliance, September 7, 2021.
- 69 Urban Libraries Council, “Connecting Communities with Teleservices.”
- 70 [“Patrons Gain Skills with Digital Navigators,”](#) King County Library System. October 29, 2021.
- 71 Kristi Eaton, [“Digital Navigators Help Oklahoma Residents Break Through ‘Digital Divide,’”](#) The Daily Yonder, February 3, 2022.
- 72 [Connect Arizona](#), accessed November 29, 2024.
- 73 [“Digital Navigators,”](#) California State Library, accessed November 29, 2024.
- 74 [“ARPA Grants to CT Public Libraries,”](#) Connecticut State Library, accessed November 29, 2024.
- 75 [“Department of Health to Bring Health/Digital Navigators and Telehealth Support Services to Underserved Communities,”](#) State of Hawaii Department of Health, July 26, 2021.
- 76 [“NJLA Announces 12 Libraries to Participate in the Access Navigator Program,”](#) New Jersey Library Association, October 22, 2021.
- 77 [“Texas Digital Navigators Grant Program,”](#) Texas State Library and Archives Commission, accessed November 29, 2024.
- 78 Sarah S. Goek, [Public Library Services for Strong Communities Report: Results from the 2022 PLA Annual Survey](#) (Public Library Association, 2023).

- 79 Goek, *2023 Public Library Technology Survey*.
- 80 "[About ConnectHomeUSA](#)." U.S. Department of Housing and Urban Development, accessed November 29, 2024.
- 81 "[Connecting Minority Communities Pilot Program](#)," National Telecommunications and Information Administration, accessed November 29, 2024.
- 82 Brian Howard and Traci Morris, *Tribal Technology Assessment: The State of Internet Service on Tribal Lands* (Arizona State University American Indian Policy Institute, 2019).
- 83 Marisa Elena Duarte, *Network Sovereignty: Building Internet Across Indian Country*, (University of Washington Press, 2018).
- 84 Rhinesmith and Kennedy, *Growing Healthy Digital Ecosystems*.
- 85 "[ARPA Local Relief Frequently Asked Questions](#)," National League of Cities, accessed November 29, 2024.



# AUTHORS



**Amelia Bryne** is co-director of the research consultancy DeepTech.org. She has worked with the American Library Association Public Policy and Advocacy Office, the Social Science Research Council, the Community Wireless Infrastructure Research Project, byDesign eLab, and other public interest research projects and institutions. Her research has been published in journals such as Telematics & Informatics, Policy & Internet, and the Journal of Community Informatics.



**Revati Prasad** is the vice president of programs at the Benton Institute for Broadband & Society overseeing the Institute's programmatic and research work, including the Marjorie & Charles Benton Opportunity Fund fellowship program. Dr. Prasad holds a Ph.D. in Communication from the Annenberg School for Communication at the University of Pennsylvania and an MPA from Columbia University's School of International and Public Affairs.



Broadband Delivers Opportunities  
and Strengthens Communities