

**Understanding Barriers to Digital Equity in Little Rock, Arkansas:
How the Mayor's Office Can Impact Internet Adoption**

Robert Amponsah and Elysa Vargas

Leadership and Learning in Organizations, Vanderbilt University

Dr. Marisa Cannata

May 01, 2023

Organization Context

Partner Organization

The Mayor's Office in Little Rock, Arkansas serves a population of approximately 202,591 according to the 2020 census. In 2018 Frank Scot Jr. took office as the 73rd mayor and the first elected Black chief executive. His constituency is 49.9% white, 40.9% Black, 7.5% Latino, 3.1% Asian, 0.3% American Indian, and 0.1% Native Hawaiian/Pacific Islander (U.S. Census Bureau, 2020). Under his leadership the office generated a number of initiatives aimed at improving life within the city boundaries, especially for people of color. Among these initiatives are programs targeted at improving schools, increasing public input into Little Rock decisions, and further building out the city's infrastructure. Helping to enact these equity efforts are the city's Chief Equity Officer and the Chief Education Officer. Though Little Rock was concerned about access to reliable internet prior to the pandemic, when schools and businesses shifted to a hybrid operation model, issues of digital equity rose to the forefront of the city's priorities.

Problem of Practice

Little Rock's Digital Divide

The digital divide has been defined historically as those who have physical access to a computer with internet and those who do not. However, the literature indicates that the idea of access is far more complex than availability of the technology. The National Digital Inclusion alliance defines digital equity as a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. On a national level, the COVID-19 pandemic and subsequent social distancing mandates resulted in a surge of internet-enabled remote services and opportunities within healthcare, education, and workforce systems, with some sources indicating that, "Internet services have seen rises in usage from 40% to 100%, compared to pre-lockdown levels" (De et al., 2020). Out of necessity, people began taking advantage of telehealth services and online schooling, while a myriad of office-based organizations pivoted to work from home models. Unfortunately, the flexibility these technological advances offered was not accessible to everyone. According to the Federal Communications Commission (FCC), even though the digital divide is narrowing, there are still an estimated 21 million people in the United States without internet access or sufficient internet speed. These non-users, as noted in Kate Farrish's (2020) article "Health Care and Education Suffer When There's No Internet Access," are more likely to be poor, living in rural areas, and are Black or Hispanic. Without reliable internet services during this time, and in the future, these marginalized groups are subject to additional inequities within the healthcare, education, and workforce sectors.

Having travelled significantly down the path of virtual operations, it is likely the US will continue to see increased telehealth services, hybrid schooling, and work from home opportunities in the years to come. Another likelihood will be ongoing government incentives to improve network infrastructure, as has been evident with the Connect America Fund and the Rural Digital Opportunity Fund (RDOF). Although these programs are in their infancy, the reverse bidding

process associated with RDOF has already been criticized by experts for overpromising on speeds that are unrealistic (Rivkin-Fish, 2021). Thus, a critical equity question to consider if Little Rock's intends to utilize these federal funds to expand public Wi-Fi infrastructure, is who is currently most impacted by access issues within the city and how might funds be leveraged to increase access for those specific communities?

At face value it may appear that Little Rock is not experiencing digital equity challenges; in fact, the 2019 American Community Survey (ACS) conducted by the census bureau identified that 86.3% of households had an internet subscription while 16.4% did not. However, upon further review, a disaggregation by household income indicates that in low-income households roughly a third do not have an internet subscription and in median-income households approximately 20% are without internet. Additionally, the lack of devices in Pulaski County households limits the residents' ability to meet their usage needs. In fact, less than 10,000 households have a desktop or tablet within the home and close to 15,000 residents have no computer at all (ACS, 2019). Currently, the ACS does not include metrics related to digital literacy, which may be an additional contributing factor to Little Rock's digital equity issues. To understand digital equity, it is also important to consider how technology contributes to or neutralizes existing inequities. Thus, working towards digital equity in Little Rock will include a focus on race, sex, ableism, geography, and socioeconomic status. To date, the Mayor's Office has sought to better understand digital equity within the city by analyzing census data and FCC broadband data, engaging community leaders in thought partnership, and surveying households via a partnership with Little Rock School District.

Mayor's Office Progress to Date

To address these inequities within the city, the Mayor's Office has developed a small team to develop and enact a 2022 Digital Equity Plan. The Mayor's Office defines digital equity as access to reliable, high-speed internet, digital literacy, and the availability of devices and software that meet the needs of the user. The plan encompasses the three components of digital equity and includes specific activities such as: carrying out an independent speed-test during high usage times; building out Wi-Fi access in public areas; continuing the city-wide American Connectivity Program; collaborating with libraries to increase digital literacy training; creating a database of digital literacy resources; offering digital skill apprenticeship programs; and establishing a computer donation/refurbishment drive. Overseeing this work is the Chief Education Officer with support from a policy analyst and an American connection corps fellow. This team is enacting the plan but has found it difficult to get traction collaborating with community organizations and individual stakeholders to realize one aspect of the plan, improving the city's public wi-fi access network. As such, a primary focus of this capstone is to understand the needs of individuals and the community in order to provide recommendations as to how the Mayor's Office can increase utilization and access of the city's public Wi-Fi and strengthen the overall plan

Though the city already has infrastructure for public Wi-Fi access points, usage data indicates that these access points are not widely used. As part of the work to increase digital equity within the city, the Mayor's Office would like to reconsider how they can develop and maintain a public Wi-Fi program. One question is how to work in tandem with several

community and corporate organizations engaging in similar work. Though these organizations are dedicated to improving the current state, each has a slightly different take on how to address the problem. Thus, streamlining a course of action that can be shared with the broader public is an area of need. Another challenge is understanding how to best leverage areas the public frequents, with an eye towards an equitable roll out of access points. While they are in conversations with the Central Arkansas Library System (CALs), community centers, and the Little Rock School District, each entity has its own set of priorities, which in some cases has led to disagreement about how to proceed. This project will explore incorporating public input (both at the organization and individual level), analyzing city data (such as population density, income levels, and race), and evaluating internet speeds to ultimately arrive at improvements for their systems. The central question to this exploration is: How can the Little Rock Mayor's Office build a stakeholder-informed internet access (adoption) strategy to decrease the digital divide affecting underserved and unserved populations as a means to increase digital equity within the larger Little Rock populace's served and unserved communities?

Review of Literature

An Abbreviated Timeline of the Internet in the United States

The first glimpse of the internet as we know it today was born in the 1990's when hypertext markup language (HTML) and the uniform resource locator (URL) were developed. Quite rapidly, content began being hosted online, and people around the country sought ways to engage with this emerging technology. A decade later, society was grappling with issues of access and control. There was a meteoric rise of organizations conducting business online with the intention of establishing themselves as the preeminent operator within their industry. Additionally, federal cases abounded seeking to protect intellectual property being shared openly via the web (Andrews, 2019). While the number of homes adopting the internet rose exponentially each year, access was clearly segmented by many demographic characteristics (Andrews, 2019). By 2003, adoption rates between rural and urban homes had reached a near parallel; however, with the advent of high-speed internet, the access conversation began to shift towards quality of access. The Federal Communication Commission (FCC) considers those with less than a 25 megabytes per second (mbps) broadband download speed as unserved while those below 100 mbps are considered underserved. On average, the homes with high-speed internet had higher levels of education and income and were less likely to have a Black or LatinX head of household (Whitacre & Mills, 2010). Over the next twenty years, technology continued to advance, and eventually people were able to access the internet while on the go with their mobile devices. By 2020, 93% of American adults were using the internet either via fixed or mobile connections (Vogels, 2021). 2020 was also the year, however, that the COVID-19 pandemic brought about an increased reliance on technology and the internet for work, health, and schooling. While popular opinion may have been that the United States had rapidly reduced digital inequities, the pandemic revealed that a substantial number of communities were still negatively impacted by the digital divide.

What is the digital divide and how has it impacted Little Rock, Arkansas?

Though the digital divide has become more nuanced over time, it is most simply described as a lack of access to high-speed internet and/or access to a suitable device (Van Deursen & Van Dijk, 2019). Van Deursen and Van Dijk refer to this as the first-level digital divide. A review of the 2021 American Community Survey (ACS) data does not reveal a clear understanding of the extent to which a first-level digital divide persists amongst Little Rock residents. As shown in Figure 1, 94% of residents have one or more computing devices in the household. Thus, while it appears there is adequate access to devices across the city, without further disaggregation by income and race, it is unclear how lower-income households and communities of color compared to higher income and white communities.

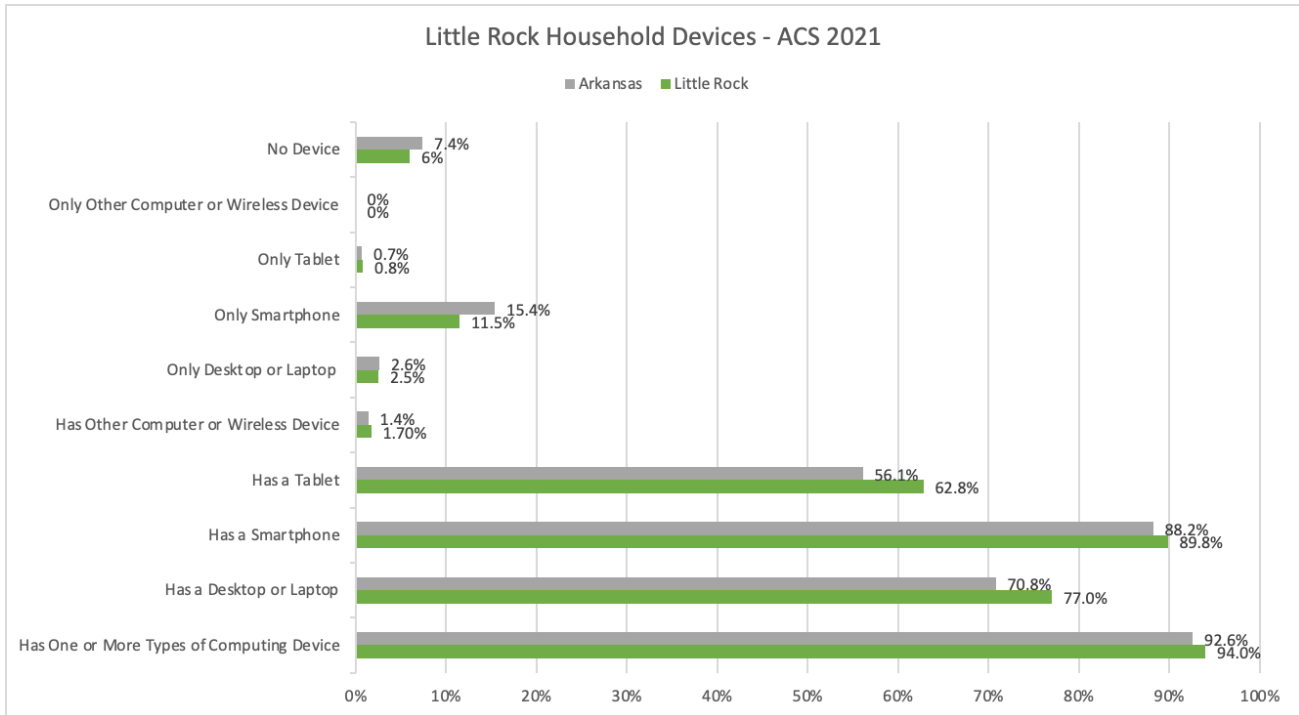


Figure 1

Depicted in Figure 2 is the presence and type of internet in Little Rock households. 90.1% of Little Rock households have an internet subscription, outperforming the state's 85.7% presence. Additionally, it appears the most common type of internet service is a broadband connection.

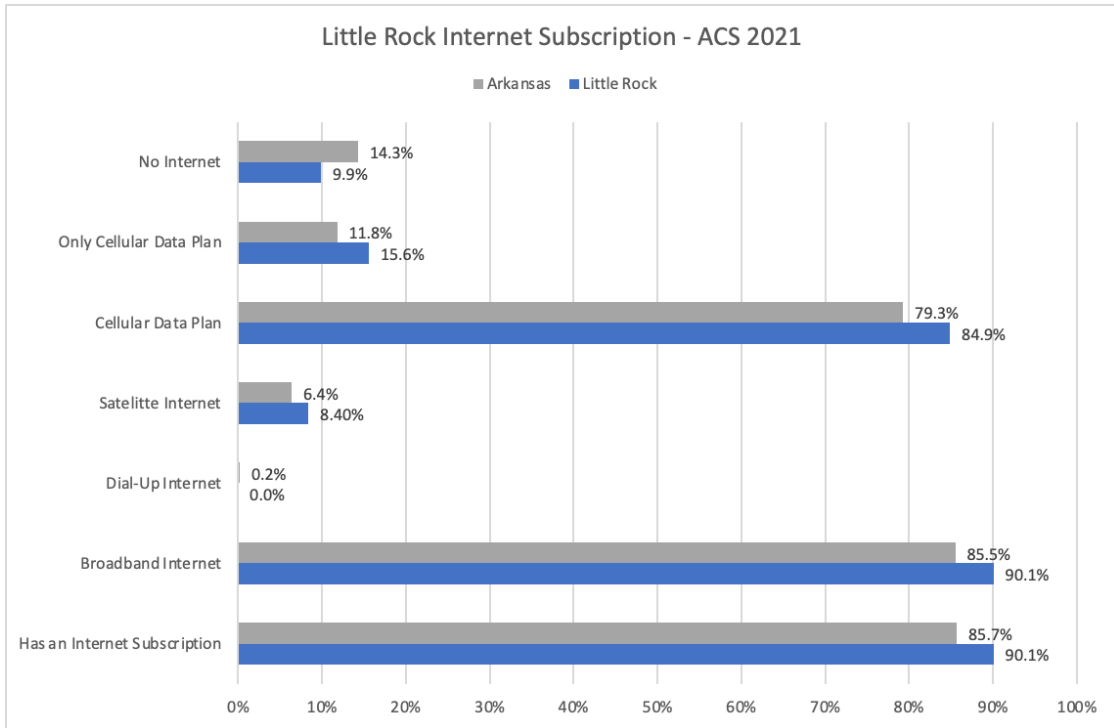


Figure 2

Though the majority of households have an internet connection, Figure 3 shows income disparities amongst home internet adopters. While 97.8% of households with an adjusted household income above \$75,000 have an internet subscription, the percentage drops to 71.2% for households with an income less than \$20,000.

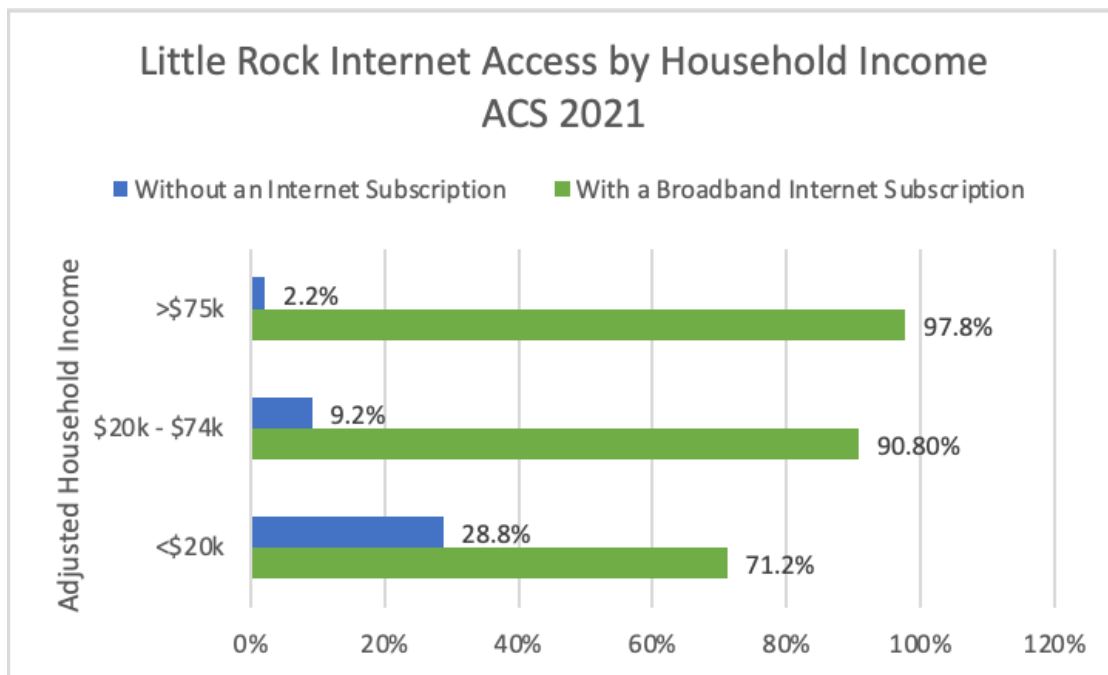


Figure 3

Due to the way ACS data is reported, it is not possible to disaggregate access to internet and devices by race within Little Rock. National studies, however, demonstrate differences in adoption across white, Black, and Hispanic populations, with up to a 15% adoption rate deficit for people of color (Pew Research Center, 2021). Understanding Little Rock’s divide from the perspective of race was a goal of this research.

Unfortunately, the digital divide is not as simple as a lack of the internet or an appropriate device, otherwise the abundance of technology today might have already solved our nation’s digital equity challenges. An additional layer of the digital divide is an individual’s ability to engage with technology in a meaningful way. A lack of digital skills is referred to as the second-level digital divide (Van Deursen & Van Dijk, 2019). Device and internet access are ineffectual without requisite skills, as “Having a connected computer and the skills to use it productively is a fundamental need in today’s society” (Newswire, 2022). Within this second level digital divide reside the operational skills, information navigation skills, social skills, and creative skills required for internet competence (Scheerder et. al, 2017). In fact, in today’s economy roughly 80% of middle skill jobs, even historically nontechnical jobs like warehouse packer or personal care aide, now require a minimum level of digital skills (DigitalUS, 2020). Helsper (as cited by Scheerder et al., 2017) defines use of the internet across four broader categories: economic, cultural, social, and personal. Varied usage was never more evident than during the COVID-19 pandemic. Research out of the University of Santa Barbara found that a “vast majority of Americans say the internet has been ‘essential’ during the pandemic, a quarter of Americans also report regularly needing help with new online activities, and 30% of Americans have been classified as generally low in ‘tech readiness’” (Digiunity, 2022).

Arkansas as a whole is a model of promising practices that address the second-level digital divide. One initiative is the Central Arkansas Library System's (CALS) digital guide program. The CALS program is free to all and offers a variety of group workshops as well as one-on-one appointments with a guide who will assist an individual with a range of online activities such as paying bills or applying for government assistance. An additional indicator that demonstrates Arkansas' current efforts to improve digital skills is the preponderance of high schools (89%) that offer computer science courses. This is more than any other U.S. state (State of Computer Science Education, 2020). Though Little Rock benefits both from the CALS program and high school computer science classes, additional city services may be beneficial. Digital inclusion within the city limits will involve ensuring people have a medley of skills to be able to navigate technology and receive the maximum benefit.

Even when there are sufficient devices, access, and skill to interact with the internet, issues of digital equity often persist. A third level of the digital divide is related to the tangible outcomes benefitting groups that are most likely to maximize the use of digital tools (Van Deursen & Van Dijk, 2019). In other words, awareness of the capabilities of devices and the internet are determining factors in the quality utilization of the internet: Do all groups equitably benefit from their usage of the technology? This third-level divide is particularly heightened when contextualized in schools. Watschauer et al. (2004) looked at technology usage in 10 California public high schools representing neighborhoods with varying socioeconomic status. They found no first-level or second-level digital divide; the student to computer ratio was relatively the same and all students had similar technology proficiencies. What was drastically different was how the technology enhanced core classroom instruction. The schools in higher socioeconomic areas invested in professional development and infrastructure that enabled stronger integration of the technology; as a result, instructors from higher socioeconomic schools used technology for more rigorous tasks such as statistical analysis and scholarly research. Students attending schools in lower socioeconomic neighborhoods did not learn new technological skills and engaged in activities like word processing and presentation creation. In fact, in a metaanalysis of digital divide research, Scheerder et al. (2017) found that most of the research has focused on the second level digital divide, or skills and uses. Working towards augmented digital equity requires the understanding that third-level digital divide is ever present and more nuanced than ever before.

How have digital equity initiatives fared?

One of the first major initiatives designed to improve digital equity, exclusively the first-level divide, were government grants to fund infrastructure and broadband expansion in rural communities. In 2008 the Federal Communications Commission and the United States Department of Agriculture worked together to develop a broadband strategy for rural America. While access expanded, the FCC measured deployment by "the population in the census blocks with coverage for the service divided by the total population in the area being considered" (Boerngen & Rickard, 2021), which did not accurately capture how many people had home access to broadband. In 2019 the Arkansas Rural Connect (ARC) was created with the aim of providing infrastructure grants to providers who could expand high-speed broadband in rural communities (Benton Institute for Broadband & Society, 2019). The original \$4.7 million budget focused on

municipalities with a minimum of 500 people where at least 20% of the population was without coverage. With the addition of the Coronavirus Aid, Relief, and Economic Security (CARES) act, a supplementary \$119.3 million was poured into the original program. While these initiatives increased home internet adoption in the state, the focus has almost entirely been on the rural populations of the state, neglecting the BIPOC and low-income communities in urban areas. In fact, Arkansas' broadband manager's report explicitly states, "Arkansas is much more poorly served with broadband than its rurality alone can explain" (Arkansas Department of Commerce, 2020). As the federal and state governments continue to provide funding for expansion, how access is measured will be an important consideration in understanding the impact on digital equity.

At a more local level, two popular digital initiatives have been hotspot lending programs and the leverage of public library infrastructure to increase home adoption. The research indicates that hot spot lending programs have successfully increased access, and users express positive sentiments about the initiative (Salsbury & Hansen, 2022). However, a major drawback of these programs is the scalability. Due to the associated costs, procurement, maintenance, and marketing of a hot spot lending, this resource intensive initiative is most appropriate for localized implementation like a school, library, or business (Salsbury & Hansen, 2022). Thus, if solutions aim to impact a greater percentage of underserved and unserved residents, implementation feasibility and intra-organization responsibility should be considered. Another study of local solutions was conducted by Whitacre and Rhinesmith (2015), who sought to understand whether there was a correlation between increased access to devices and internet availability at community libraries and home adoption. While no relationship was found, researchers wondered if the library user should be considered unserved because their technology needs were being met despite the access not being within the home. Furthermore, not only did the libraries provide a device and access, but they also provided resources that ensured people had the skills and support for high-quality usage. Their research speaks to the need to design a digital equity plan that comprehensively addresses the totality of the first-, second-, and third-level digital divide barriers instead of approaching them individually.

The Convergence of Levels within Little Rock, Arkansas

Initial conversations with the Little Rock Mayor's Office revolved around support for developing a stakeholder-informed expansion of the current public Wi-Fi network. This was in part due to the established priorities in the city's digital equity plan. The city divided digital equity into three key areas: internet access, device access, and digital literacy. US Census data and Little Rock School district family surveys were incorporated in the recommendations for each of the three focus areas. The recommendation to increase internet access focused on verification of internet speeds, heightened awareness of public wi-fi, and promotion of affordability programs. To impact digital skills within the city, the Mayor's Office partnered with the Central Arkansas Library System (CALs) to augment the reach of their existing digital literacy program. The third focus area of increasing resident access to devices was to be accomplished by sharing device affordability programs and promoting device donation drives. In summary, the city's digital equity plan is built around increasing internet and device access (the first-level digital divide) and enhancing existing digital literacy programs (the

second-level digital divide). While detailed demographic data was collected, current plan recommendations address the city as a whole. To address the third level of the digital divide, the city must continue to develop strategies to understand which groups are most impacted by the digital divide and then design solutions to improve digital equity for those groups least likely to receive digital benefits. Our research explored how the city's recommendations were connected to the root cause of each of the levels, with an emphasis on the third level and awareness of the internet's widespread benefits. We believe this perspective will enable sustainable continuous improvement.

As we continued research in support of the Wi-Fi expansion, we wondered what other factors might be mitigating digital equity within the city. While it remains a priority to understand who in Little Rock has home access to devices and internet and who does not, we also seek to triangulate this information with residents' online behaviors and needs, and with community-based digital equity initiatives. The Mayor's Office had previously determined Wi-Fi access points as a key driver of increasing internet access within the city. Our research has broadened our focus beyond the first-level digital divide to consider the relationship between resident access and skills, and the quality of their engagement with digital tools and internet benefits. Therefore, the revised scope of work with the Mayor's Office is to provide a set of recommendations based on residents' feedback to enhance the city's digital equity plan.

Project Questions and Framing

In 2022, the City of Little Rock developed a Digital Equity Plan that addresses three focus areas: Internet Access, Digital Literacy, and Connected Devices. The internet access portion of the plan currently focuses on increasing reliable, quality, and affordable internet services by conducting speed tests, increasing awareness and access to public wi-fi areas, and continuing promotion of affordability efforts like the American Connectivity program. Although access is an important component to closing the digital divide, the likelihood of internet adoption is impacted by a multitude of factors including household characteristics, internet infrastructure, and individual traits such as age, race, education, and income (McConaughy and Lader, 1998; Cooper and Kimmelman, 1999; Rose, 2003). It is also important to understand *how* technology is being leveraged and not just *who* has access to technology (Warschauer et al., 2004). To truly impact adoption, learning more about the impacted community is critical. To ensure the plan has the most benefit for Little Rock residents, our proposed project will examine data from the city's stakeholders to determine the best path forward to improve digital access and adoption among Little Rock citizens.

Research Questions:

The purpose of this capstone is to ensure that the Little Rock Mayor's Office builds a stakeholder-informed digital equity plan that includes strategies to increase home internet adoption, thereby decreasing the digital divide in underserved and unserved populations while increasing digital equity within the larger Little Rock community.

Main Project Question

PQ1: What are the main factors contributing to the utilization of internet inside and outside of the home in Little Rock, Arkansas?

Sub-questions

SQ1: How do Little Rock citizens spend their time online?

SQ2: What is the level of awareness of the internet's utility and benefits to adopters and non-adopters?

SQ3: How are various governmental and non-governmental organizations coordinating digital equity efforts and communicating these efforts to residents?

The primary question acknowledges digital disparities and seeks to identify the most prominent factors restricting access for Little Rock residents. The first and second support questions are designed to understand how, where, and how often residents interact with the technology. The third question focuses on organizational behaviors that can be leveraged to enhance Little Rock's digital equity plan. As a reminder, this plan includes priorities around access to the internet access to devices, and enhancing digital skills. This research project will advance the Mayor's Office plan by providing specific recommendations to augment utilization-related benefits for impacted resident populations. Aligning the findings across this set of questions will assist in the development of recommendations to improve access for Little Rock.

Project Design

Conceptual Framework

The digital divide is often described as having three distinct, progressive levels. At the first level, people need access to appropriate devices and the internet; the second level encompasses digital skills that facilitate digital interactions; the third level refers to maximizing internet-related or internet-dependent benefits. While seeking to understand adoption and use behaviors, we look to the work of Venkatesh, Thong, and Xu (2012) and their unified theory of acceptance and use of technology 2 (UTAUT2). See figure 4 below.

Conceptual Framework for Technology Acceptance and Use

The UTAUT2 model was originally conceived to understand how new technology is accepted and used within an organizational context. Venkatesh, Thong, and Xu then updated the model to consider how individual consumers accept and use technology, as well as the moderators of those behaviors. In their model, performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit directly influence the desire to accept technology, which in turn is related to actual use of the technology. Additionally, facilitating conditions and habit were most directly related to the use of technology. They also found that age, gender, and experience moderated the relationship for many of the constructs. In the UTAUT2 model, performance expectancy is "the degree to which using a technology will provide benefits to consumers in performing certain activities"; effort expectancy is "the degree of ease

associated with consumers' use of technology"; social influence is "the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology"; facilitating conditions is "consumers' perceptions of the resources and support available to perform a behavior"; hedonic motivation is "the fun or pleasure derived from using a technology"; price value is "the cognitive tradeoff between perceived benefits of the application and the monetary cost"; and habit is "the extent to which people tend to perform behaviors automatically because of learning" (Venkatesh, Thong, & Xu, 2012, pp. 159 – 161).

The first two levels of the digital divide cleanly map onto the UTAUT2 model. The first level of access can be connected to nearly all of the constructs, except perhaps facilitating conditions which have a stronger connection to the second level, digital skills. What is missing from the model is the quality of technology usage. Usage in this model appears to be binary, uses or does not use. Research on the second level digital divide, however, suggests usage is a spectrum. The internet is a tool, and to maximize the benefits of a tool, one must be aware of the tool's capabilities and must be skilled enough to engage its outcomes.

Driven by the literature around the second and third-level digital divide, we propose a modified version of this framework to include cultural capital as a moderator of performance expectancy and use behavior. Scheerder et al. (2017) suggested, "Second- and third-level digital divide research on social (e.g. digital support and formula volunteering) and cultural (e.g., cultural capital and religion) determinants needs more attention and might provide better explanations of how Internet users obtain (or do not) beneficial outcomes" (p. 8). We have added cultural capital to the model and defined it as the extent of a user's knowledge of and familiarity with the internet's capabilities. Cultural capital therefore should moderate an individual's performance expectancy such that awareness (or lack thereof) would strengthen or weaken expectations of receiving a benefit. Similarly, cultural capital would also directly moderate the use behavior, resulting in the variety of usage currently missing from the UTUAT2 framework. This modified UTUAT2, as applied to the digital divide, enabled us to visualize entry points by which to address digital equity in Little Rock, Arkansas, and impact adoption rates within the city. See Figure 4. We will seek to understand how each of the constructs contributes to access and how the Mayor's Office may affect these barriers to promote adoption and high-quality usage, thereby improving digital inclusion within the city.

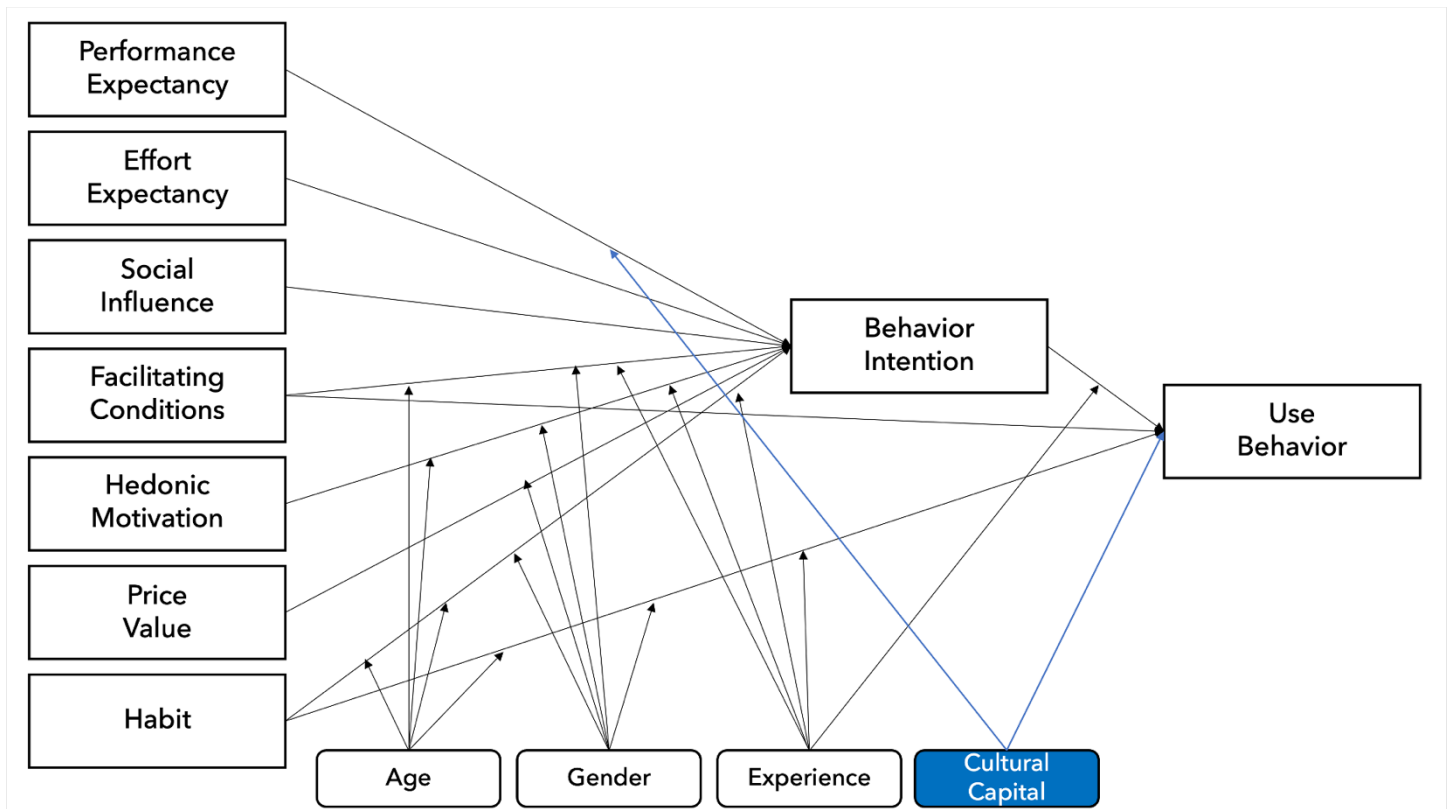


Figure 4

Data Collection and Analysis Plan

Triangulating residents’ beliefs with online behaviors and an organization’s digital equity initiatives is the goal of the data collection process. This requires a mixed methods approach involving use of publicly available datasets, a resident survey, and interviews with local organizations. The table below depicts which methods are aligned to each research question.

Research Questions Table

Table 1. List of research questions and data methods.

Research Question	Data Collection Method	Sample	Recruitment
What are the main factors contributing to the utilization of internet inside and outside of the home in Little Rock, Arkansas?	1. Census data	Convenience Survey	Survey Distribution: <ul style="list-style-type: none"> • Library <ul style="list-style-type: none"> o Digital Survey o Paper Copies • Excel by 8 Partners <ul style="list-style-type: none"> o Digital Survey o Paper Copies
	2. Local Internet Speed & Usage	Sampling: <ul style="list-style-type: none"> • Library Visitors • Excel by 8 Program 	
	Data via Broadband Now	Participants <ul style="list-style-type: none"> • Park Visitors 	
How are Little Rock citizens spending their time	3. Resident Survey	<ul style="list-style-type: none"> • Park Visitors • Grocery Store 	<ul style="list-style-type: none"> o Digital Survey o Paper Copies
	1. Resident Survey	<ul style="list-style-type: none"> • Grocery Store 	<ul style="list-style-type: none"> o Paper Copies

<p>online?</p> <p>What is the level of awareness of the internet's utility and benefits to adopters and non-adopters?</p>	<p>1. Resident Survey</p>	<p>Customers</p> <ul style="list-style-type: none"> • Local Small Businesses 	<ul style="list-style-type: none"> • Park Pavilions <ul style="list-style-type: none"> o QR Codes for Digital Survey • Grocery Store <ul style="list-style-type: none"> o Digital Survey
<p>How are various governmental and non-governmental organizations coordinating digital equity efforts and communicating these efforts to residents?</p>	<p>1. Interviews</p>	<p>Purposive Sampling:</p> <ul style="list-style-type: none"> • Central Arkansas Library System • Excel by 8 • Winthrop Rockefeller Foundation • Mayor's Office 	

Resident Survey

We used non-probability convenience sampling for survey distribution. In designing recruitment strategies for participation in this project, we considered how to ensure survey completers included both internet adopters and non-adopters. This was central to the question of what barriers exist for non-adopters. We addressed the concern in two ways: survey format and distribution method. To maximize participants within the sample population, the survey was available in two languages and in two formats, digital and paper. Non-adopters or those with limited digital skills could opt to complete the survey via a paper copy, a digital version, or an assisted digital version. Also, potential participants could access the survey in a variety of locations that would capture input from adopters and non-adopters of the internet. Flyers with the survey QR code were posted at 5 park pavilions and 4 public libraries throughout the city. In conjunction with the Mayor's Office, researchers selected specific libraries and park pavilions based on a variety of criteria that would allow the survey to reach citizens most impacted by the digital divide. This criterion included areas with city-provided Wi-Fi access, libraries with digital guides, areas with lower household incomes and higher racial diversity, as well as well-trafficked public locations. Two weeks into the survey administration, and in response to the survey response rate, researchers decided to send additional communications to specific groups on Facebook and LinkedIn. These contacts were based on specific neighborhoods of focus as identified by the Mayor's Office, the number of members in local Little Rock groups, and group posting activity. Additionally, researchers identified zip codes with low rates of computers in the household or no broadband service as indicated by the 2021 American Community Survey. Within these zip codes, researchers distributed paper copies of the surveys at grocery stores and stationed themselves during high-traffic hours to

help complete the digital survey via a tablet. A final distribution method included working with local non-profit organizations and small businesses to help distribute bookmarks with the survey QR code to their clients and patrons. This methodology ensured wide participation as a sample of the Little Rock community.

The survey distributed to residents is an anonymous twenty-question form aimed at collecting demographic data about the population sampled as well as their behaviors, values, and level of awareness of internet subsidy programs, internet benefits, and internet uses (appendix A). Demographic questions first ask participants to identify their race and ethnicity, household income, education, and gender, all of which are factors that have been identified as having a relationship to internet adoption behaviors (Van Deursen & Van Dijk, 2019). The second half of the survey asks participants to describe how they access the internet (e.g., *Do you have access to an internet subscription service at home?*), how they utilize the internet (e.g., *Please let us know if you have ever engaged in the following internet-related or online activities*), and the value of the internet in their lives (e.g., *How important is the internet in your life?*). To address the dual questions of factors that contribute to internet utilization and how Little Rock citizens spend their time online, researchers focused on descriptive graphical analysis to compare frequencies and mean results grouped by the following demographic characteristics: gender, race, household income, age, education level, employment status, and location. To further understand behaviors within subgroups of interest, we ran a number of Chi-square tests of independence. Once a significant relationship was determined between variables, additional Chi Square tests of independence were run to identify which of the variable levels had significant relationships.

Table 2. Variables for Chi Square test of independence.

Dependent Variables	Independent Variables
<p>Internet Subscription Type (Cable Only, Mobile Only, Both Cable & Mobile, No Access))</p>	<ul style="list-style-type: none"> • Gender • Race • Household income brackets • Age brackets • Education level • Employment status • Zip Code • Home Devices • Frequency of Internet Usage • Internet Uses • Awareness of Internet Uses • Perceived Skill Level • Internet Importance
<p>Devices at Home (Computer, Smart Phone, Tablet, Smart Appliances, Smart TV, Gaming Console)</p>	<ul style="list-style-type: none"> • Gender • Race • Household income brackets • Age brackets • Education level • Employment status • Zip Code

Devices Used to Access Internet

(Computer, Smart Phone, Tablet, Smart Appliances, Smart TV, Gaming Console)

Frequency of Internet Usage

(Daily, Weekly, Monthly, Annually, Never)

Reason for Using Public Wi-Fi

(Reliability, Affordability, Data Limits)

Internet Uses

(Online Education, Social Media, Email, Navigation Tools, Financial Services, Applied for Assistance, Shopped Online, Video

- Internet Subscription Type
 - Frequency of Internet Usage
 - Internet Uses
 - Awareness of Internet Uses
 - Perceived Skill Level
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
 - Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Frequency of Internet Usage
 - Internet Uses
 - Awareness of Internet Uses
 - Perceived Skill Level
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
 - Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Internet Uses
 - Awareness of Internet Uses
 - Perceived Skill Level
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
 - Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Frequency of Internet Usage
 - Awareness of Internet Uses
 - Perceived Skill Level
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
-

Conferencing, Health Device, Medical Appointment, Streaming,
Online Games, Safety)

Awareness of Internet Uses

(Online Education, Social Media, Email, Navigation Tools,
Financial Services, Applied for Assistance, Shopped Online, Video
Conferencing, Health Device, Medical Appointment, Streaming,
Online Games, Safety)

Perceived Skill Level

(Basic, Intermediate, Expert)

Internet Importance

(Not Important, Somewhat Important, Very Important)

- Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Frequency of Internet Usage
 - Awareness of Internet Uses
 - Perceived Skill Level
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
 - Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Frequency of Internet Usage
 - Internet Uses
 - Perceived Skill Level
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
 - Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Frequency of Internet Usage
 - Internet Uses
 - Awareness of Internet Uses
 - Internet Importance
 - Gender
 - Race
 - Household income brackets
 - Age brackets
 - Education level
 - Employment status
 - Zip Code
 - Internet Subscription Type
 - Home Devices
 - Frequency of Internet Usage
 - Internet Uses
 - Awareness of Internet Uses
 - Perceived Skill Level
-

A total of 198 digital survey responses were collected; however, 21 surveys had to be excluded from analysis due to respondent indicating they lacked Little Rock residency. For the remaining 177 responses we have included a table of survey respondents by key characteristics that were commonly identified in the literature as determinants of the digital divide.

Table 3. Demographic statistics of survey respondents.

Characteristic	Descriptor	Count of Survey Respondents	Percentage of Survey Respondents	City of Little Rock Percentages <small>(CensusReporter.org)</small>
Gender	Male	55	31%	46%
	Female	110	62%	54%
	Non-Binary/Third Gender	2	1%	N/A
	Prefer Not to Say/Prefer to Self-Describe	9	5%	N/A
	Did Not Respond	1	1%	N/A
Race	White	95	54%	49%
	Black/African American	55	31%	41%
	Hispanic/Latino	17	10%	8%
	Other/Did Not Respond	10	5%	2%
Household Income	<\$20,000	17	10%	
	\$21,000 - \$60,000	51	29%	
	\$61,000 - \$99,000	36	20%	
Age	>\$100,000	50	28%	28%
	Younger Than 30	16	9%	39%
	Between 31 – 60	102	58%	39%
	Older Than 60	58	33%	22%
Highest Education Level Obtained	Prefer Not to Say or Did Not Respond	23	13%	
	High School Diploma or Less	19	11%	29%
	Some College or 2-Year Degree	26	15%	26%
	Bachelor’s Degree	47	27%	44% (Bachelor’s Degree or higher)
	Master's or Doctorate	80	45%	
Employment	Prefer Not to Say or Did Not Respond	5	3%	
	Employed	117	66%	

Not Working (Unemployed or Retired)	46	26%
Student or Did Not Respond	14	8%

Administrative Data

While American Community Survey (ACS) data is not available by zip code, we used the 2021 ACS to triangulate survey responses related to questions regarding internet adoption and computer ownership. In general, the overall use of digital technology in our survey sample was similar to the ACS. While the ACS determined that 94% of Little Rock residents have one or more computing devices in their home, 92% of our survey respondents indicated they had a computer in their home. We also found similar results for Little Rock residents with a home internet subscription: 90.1% according to the ACS and 97.3% of our survey respondents. Though our income brackets were slightly different, ACS data revealed that 97.8% of households with an income greater than \$75,000 had a broadband connection, while 90% of our survey respondents with household incomes greater than or equal to \$80,000 had broadband in the home. We also used average download speed data from Broadband Now to identify which zip codes within Little Rock would be considered unserved or underserved according to the FCC’s regulations.

Organization Interviews

In addition to surveys, this project included interviews with five specific organizations. This was also a non-probability sampling but was purposive. Three individuals from the Mayor’s Office were interviewed to understand current initiatives that impact digital equity and internet adoption: the Chief Equity Officer, the Chief Education Officer, and the Director of the Information Technology Department. The goal was to identify opportunities for improvement and gain feedback on what tactics have had the most impact on the community. The Little Rock Mayor’s Office also identified specific organizations with whom they collaborate on digital equity efforts. Excel by Eight was one of these organizations, with a mission to build a reliable resource grid where all Arkansas families and communities have what they need to help children thrive. Though they operate a myriad of programs and offer a variety of services, a key priority for their network is access to devices and internet, along with the skills to use them. While their focus is not necessarily digital equity, they understand that a barrier for many of their clients in need is the lack of internet access. They collaborate with the Mayor’s Office to support initiatives that will ensure all families in Little Rock can identify and access important government, medical, and educational online services. We interviewed their Communities Director to gain greater insight into their collaboration with the Mayor’s Office. For the Winthrop Rockefeller Foundation, we interviewed their Senior Equity Officer. The Winthrop Rockefeller Foundation is focused on disrupting the systems that block Arkansans who are striving to get out of poverty. Digital equity is part of their focus, but they also strive to improve educational, economic, social, ethnic, and racial equity. This organization provides resources to grants and has experience driving equity in Arkansas. The Winthrop Rockefeller Foundation was interviewed to triangulate their efforts with those already connected to Little Rock’s digital equity plan. We also interviewed the Director of The Arkansas Regional Innovation Hub, a non-profit

organization dedicated to improving the lives of Arkansans by inspiring innovation and expanding opportunities. The Hub has sponsored several initiatives, the significant one being focused on digital literacy in the education space. The final interview was conducted with the Constituents Relations Liaison at the City of Little Rock Constituent Services. Constituent Services is a city department that serves as a point of contact for any city-related feedback or concerns. Liaisons hear directly from constituents and determine how to pass on the information to the appropriate city entity, such as the Mayor’s Office. We spoke to them to understand the feedback mechanism the Mayor’s Office uses to ensure initiatives are in direct response to the needs of the community. The Central Arkansas Library System (CALs) was initially involved in the planning stages of this project and the survey creation. Unfortunately, they were not able to accommodate an interview and referred us to their online resources to better understand their current initiatives. They are an organization that works closely with the Mayor’s Office to execute digital equity initiatives within the city. They offer digital skills workshops and provide digital guides to assist library patrons with an array of needs. Their digital guides were included in the feedback rounds of the survey creation and they are deeply invested in digital equity within the community. Following each CALs workshop or individual appointment, they shared the survey and encouraged participants to complete it.

Interview Protocol

Interviews were semi-structured around the following focus areas to identify opportunities for synergies to drive collective goals of organizations towards achieving digital equity. Each participant was interviewed for approximately 50 minutes with the goal of understanding the purpose of the organization, current initiatives around digital equity, opportunities for improvement, partnerships, community attributes, community feedback, and metrics of success. The study also allowed for time for the participants to provide feedback on a root cause analysis and capture feedback on additional insights that could inform the assessment based on the participants’ experiences. The interviews were recorded and coded to identify common themes among the study participants. All interviews were transcribed and reviewed for clarity. To address the question related to coordination of efforts amongst governmental and non-governmental agencies, researchers started with a deductive coding analysis. See the table below for initial codes used and their description.

Table 4. Initial interview codes and definitions.

Code	Definition
Collaboration/Partnerships	Positive or negative reference to working with another organization serving the Little Rock residents on a digital equity initiative.
Stakeholder-Informed Decision Making	Reference to intentional opportunities for residents to voice opinions, suggestions, concerns related to organizational programming and services.

Barriers to Engagement	Reference to challenges that inhibit the organization from being able to serve priority populations as intended.
Success Metrics	Examples of how the organization defines achieving established goals.
Inter/Intra communication	Examples of effective and ineffective communication methods related to digital equity initiatives within and between organizations.
External Communication	Examples or methods for sharing information or creating awareness related to services, programs, and initiatives within targeted populations.
Organizational Structure	Examples of organizational culture that promote or inhibit organizational initiatives.
Equity Definition	Explanation of how the organization thinks about equity within the context of their work.

A second pass at coded transcripts by a second researcher was conducted to expand and clarify textual evidence. The majority of themes were validated by the second pass of coding. However, nearly all of the organizational challenges that were identified by interviewees were challenges around communication. Therefore, this category was collapsed to become organizational structure and communication. Additionally, we expanded the barrier's theme to not just engagement but also identified barriers to digital equity. For example, the Chief Equity Officer at the Mayor's Office discussed a lack of participation from the Hispanic community in their equity labs, citing the lack of multilingual invitations that were predominately distributed via the internet. As such, a barrier to engagement was the existing barrier of digital equity itself. Appendix B includes a list of questions for which the interview participants provided feedback.

Artifact Context

After initial conversations with the Mayor's Office representatives, researchers reviewed publicly available materials for highlighted organizations such as CALS and Excel by 8. This analysis provided foundational knowledge related to the research question of how various governmental and non-governmental organizations coordinate digital equity efforts and communicate these efforts to residents. During this first pass we became familiar with artifacts by reviewing materials to understand their organization and structure. This enabled us to speak directly to city initiatives and programs during the interviews to probe more and understand how organizations may be connected.

As interviews continued, we were directed to additional surveys and reports that served to deepen our understanding of digital equity initiatives. For example, the Chief Equity Officer mentioned that the CALs website promoting digital navigators was only available in English. While these published materials included the schedule of technology classes and digital guides information on the CALS website, the interview allowed us to identify what already may be an

improvement in the works. While it was not on our initial list of artifacts to review, we also used an organization’s Twitter account as this was an avenue named by many of the individuals with whom we spoke. We reviewed not only for content but access. Understanding what information and how that information was shared with the community enabled us to connect the survey’s findings and create hypotheses.

Findings

Consistent with previous literature on the subject of the digital divide, many findings identified age, gender, socioeconomic status, ethnicity, and geography as determinants of barriers to digital equity within Little Rock, Arkansas. Our work also considered how awareness or a respondent’s cultural capital would impact the first-, second-, and third-level digital divide.

Research Question 1: What are the main factors contributing to the utilization of internet inside and outside of the home in Little Rock, Arkansas?

This first research question addresses barriers to the first- and second-level digital divides. The major finding for this question was **widespread home internet adoption, but home access (type of device, type of subscription, and skill) is more uneven and driven by education and, to a lesser extent, income and age.** Within the first-level divide there is a binary perspective as to whether people use the internet. Consistent with previous literature, this simplified understanding of access does not capture the complete context, as in our survey, 99% of respondents shared that they use the internet. As such, we opted to disaggregate access further by internet subscription type. Among survey respondents, 66% accessed the internet exclusively via cable internet, only 6% strictly via a mobile plan, and an additional 24% via both a cable and mobile plan. Only 4% of respondents indicated they did not have home internet access. These responses were then compared to the following socioeconomic and motivational determinants: race, age, household income, education level, zip code, and perceived skill level. When examining the association between education level and type of internet subscription, a chi square test of independence revealed the relation was significant, $\chi^2 (20) = 44.82, p < 0.001$. Chi Square tests for independence were also performed for each education level group which revealed that those without any college experience were less likely to have a cable subscription in the household $\chi^2 (1) 5.40, p = 0.02$ as compared to all other groups.

Table 5. Comparison of demographic and motivational characteristics with household type of internet subscription.

Characteristic	Chi Square Tests of Independence
Race	$\chi^2 (24) 24.66$ $p=0.42$ $n=143$
Age	$\chi^2 (12) 12.29$ $p=0.42$ $n=143$
Household Income	$\chi^2 (16) 23.56$ $p=0.10$

Education Level	$n=143$ $\chi^2 (20) 44.82$ $p<0.001$
Zip Code	$n=143$ $\chi^2 (56) 36.03$ $p=0.98$
Perceived Skill	$n=143$ $\chi^2 (24) 24.66$ $p=0.42$ $n=143$

Comparison of Internet Subscription Type by Level of Education

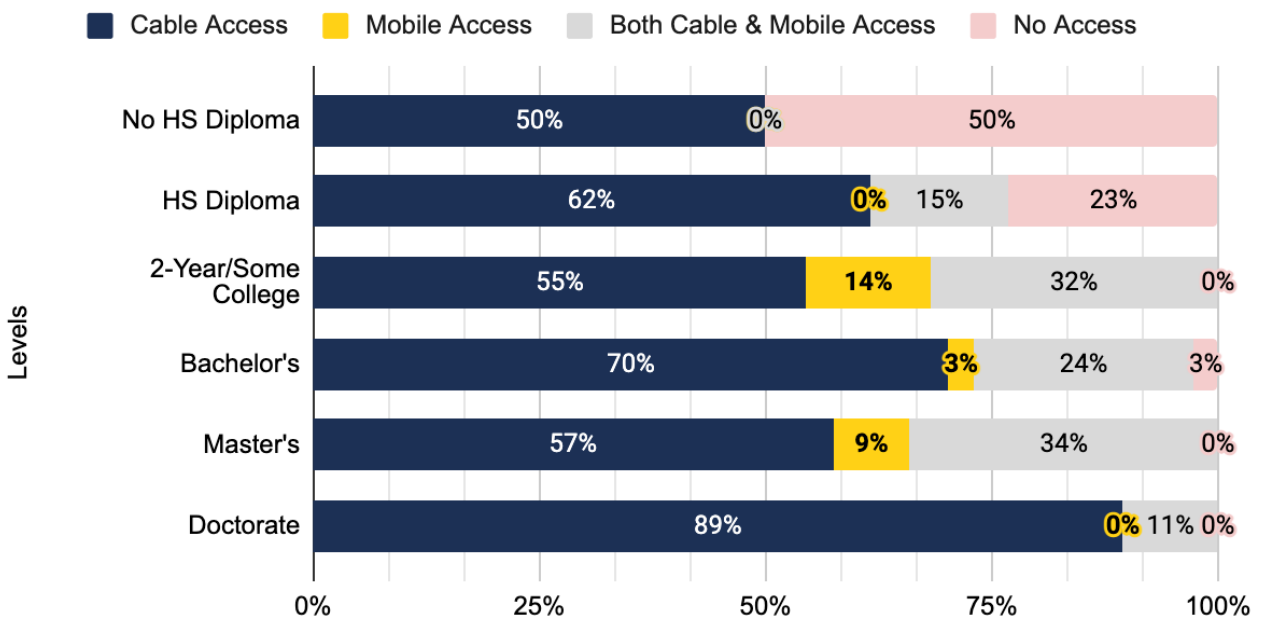


Figure 5

Another element of the first-level digital divide is access to devices. We examined whether there were any relationships between types of devices in the home with the same socioeconomic and motivational factors as type of internet subscription. Respondents indicated whether each of the following devices were present in the home: Tablet (76%), Computer (92%), Smart Phone (99%), Smart Appliances (47%), Smart TV (82%), or a gaming console (36%). A significant relationship was found between the presence of a computer in the home and education level $\chi^2 (5) = 20.45, p < 0.001$ (Figure 6). Generally, as the highest level of education increases, the likelihood of having a computer in the home also increases. Additionally, when comparing the presence of tablets in the home, a significant relationship was found with age $\chi^2 (2) = 14.42, p < 0.001$ and income level $\chi^2 (4) = 16.49, p = 0.002$ (Figure 7). For tablets in the household, we see that as income and age increase, it becomes more likely for a respondent to indicate they have a tablet.

Table 6. Comparison of demographic and motivational characteristics with devices in the home.

Characteristic	Computer	Tablet
Race	$\chi^2 (6) 4.03$ $p=0.67$ $n=146$	$\chi^2 (1) 0.29$ $p=0.59$ $n=143$
Age	$\chi^2 (3) 1.72$ $p=0.63$ $n=146$	$\chi^2 (2) 14.42$ $p < 0.001^*$ $n=143$
Household Income	$\chi^2 (4) 2.66$ $p=0.62$ $n=146$	$\chi^2 (4) 16.49$ $p=0.002$ $n=143$
Education Level	$\chi^2 (5) 20.45$ $p < 0.001^*$ $n=146$	$\chi^2 (5) 3.03$ $P=0.69$ $n=143$
Zip Code	$\chi^2 (14) 10.02$ $p=0.76$ $n=146$	$\chi^2 (14) 18.93$ $p=0.17$ $n=143$
Perceived Skill	$\chi^2 (2) 0.05$ $p=0.97$ $n=146$	$\chi^2 (2) 0.11$ $p=0.95$ $n=143$

Households with a Computer by Education Level

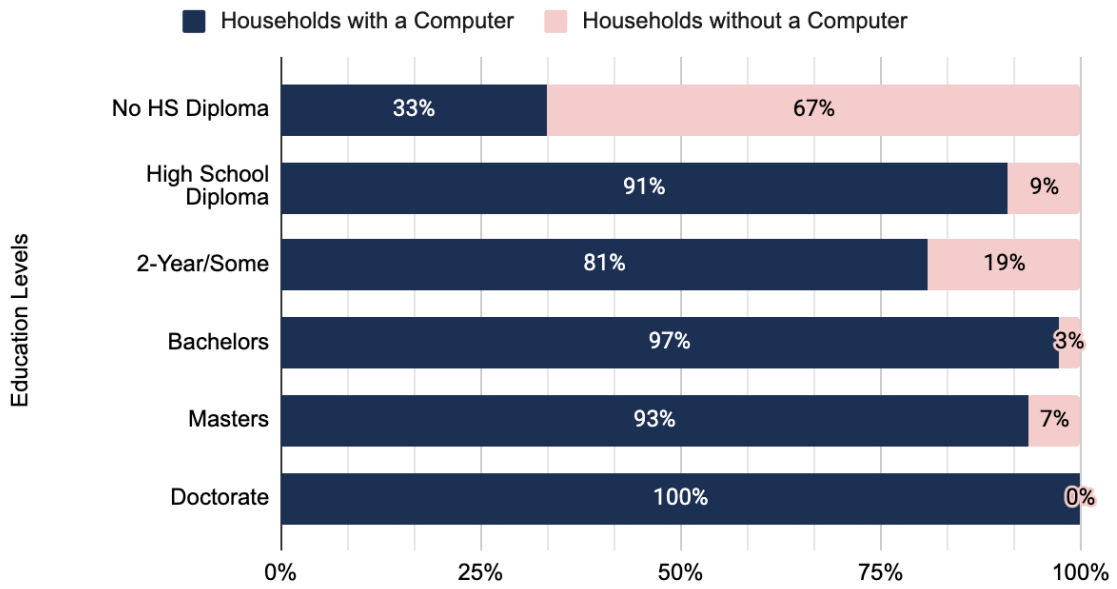


Figure 6

Households with a Tablet by Household Income

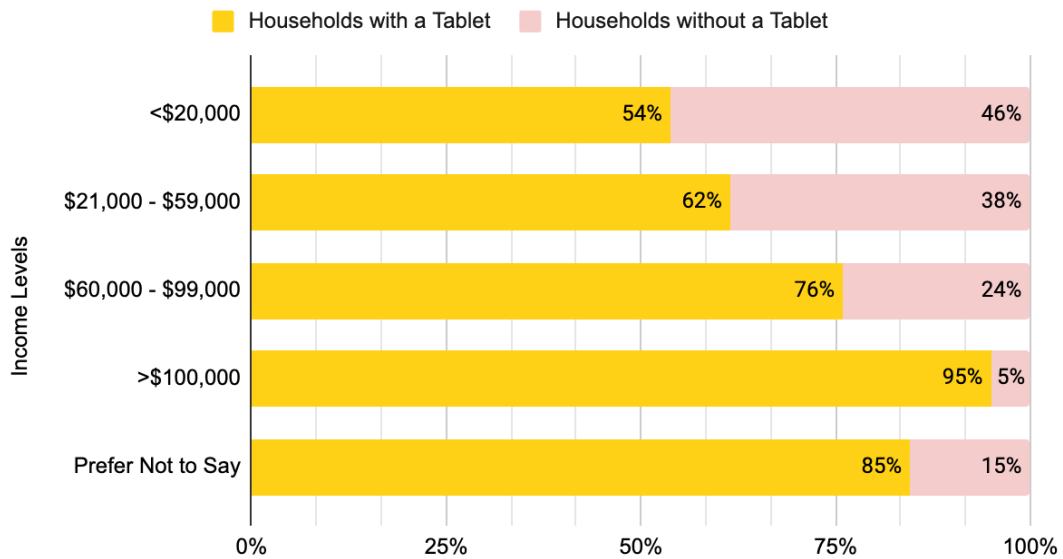


Figure 7

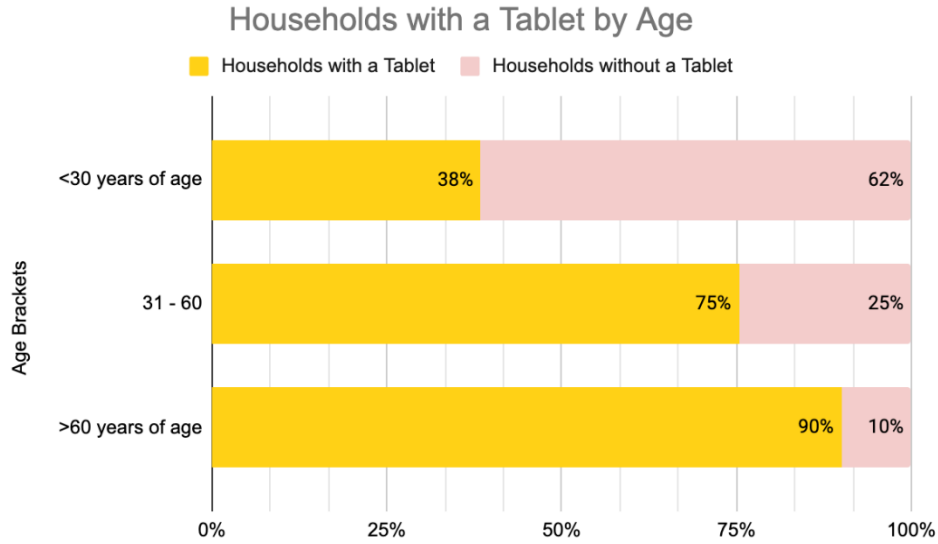


Figure 8

After determining what types of devices were more likely to be in Little Rock residences, we wondered whether these devices were used to access the internet. Respondents were asked, “If you have the device at home, do you access the internet on it?” This revealed the most common device for using the internet was a smartphone (98%), followed by a computer (89%), and then a tablet (74%).

As a final dimension of this first research question, we explored the impact of the second-level digital divide by conducting a Chi Square test for independence for respondent’s perceived skill level and socioeconomic characteristics.

Table 7. Comparison of demographic and motivational characteristics with perceived digital skill.

Characteristic	Chi Square Tests of Independence
Race	χ^2 (8) 8.32 $p=0.40$ $n=147$
Age	χ^2 (4) 14.19 $p=0.006^*$ $n=147$
Household Income	χ^2 (8) 16.46 $p=0.04^*$ $n=147$
Education Level	χ^2 (10) 12.46 $p=0.26$ $n=147$
Zip Code	χ^2 (28) 17.60 $p=0.94$ $n=147$

Results revealed two significant relationships with household income χ^2 (8) = 16.46, $p = 0.036$ (Figure 9) and age χ^2 (4) = 14.19, $p = 0.007$ (Figure 10). Upon further analysis of household income, it appears that the significantly different distribution was a result of the Prefer Not to Say group. When this group was removed from the data set, all other groups

were found to have a similar distribution of perceived skills. Additional Chi Square tests conducted for age, however, revealed that respondents older than 60 years of age were more likely to identify as having basic skills compared to younger respondents $\chi^2(1) = 5.03, p = 0.025$. In comparison, distribution of perceived skills was statistically similar amongst those younger than 60 years of age.

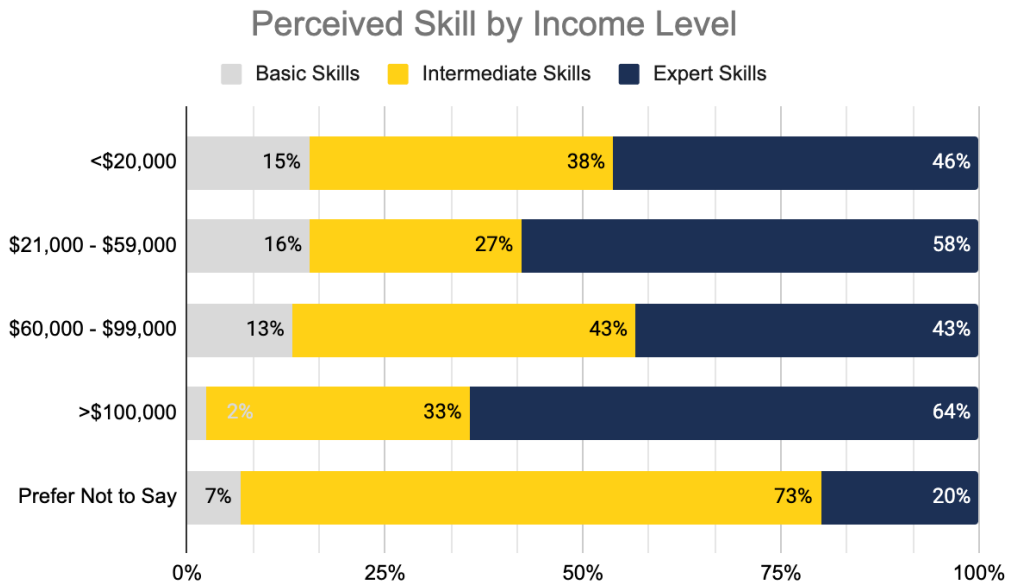


Figure 9

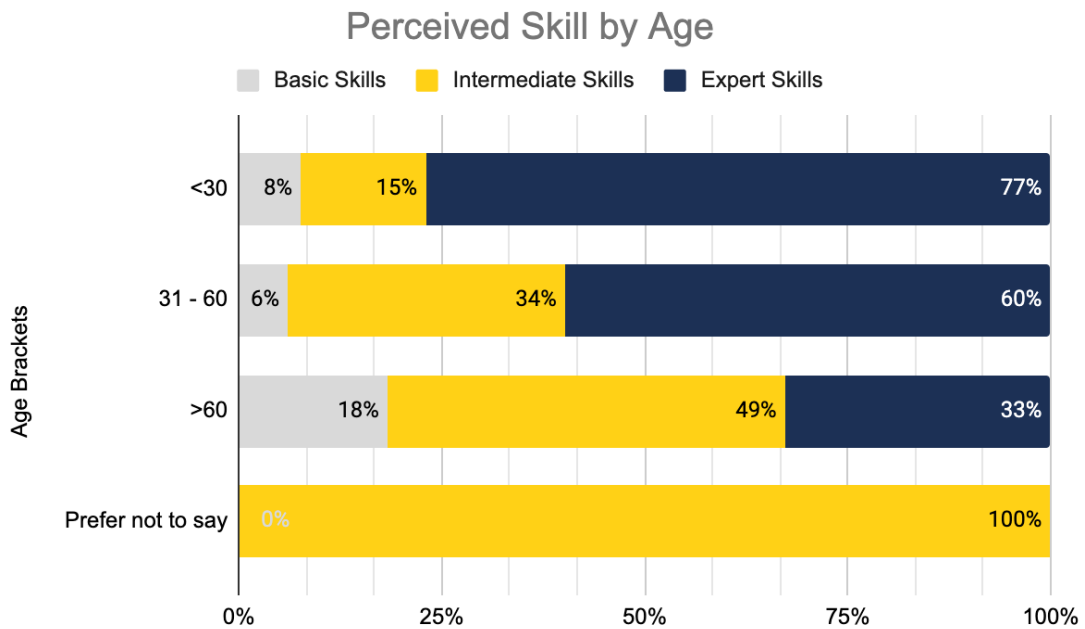


Figure 10

Research Question 2: How do Little Rock citizens spend their time online?

To answer this question, we sought to understand where respondents most often used the internet outside of the home, as well as what were the most popular online activities. We asked residents how frequently they accessed the internet in specific locations. **The major finding in this section is that both “at work” and “on-the-go” had the highest incidence of “daily” responses, indicating these are the locations where the internet is most frequently accessed.** It is helpful here to restate that the Mayor’s Office was specifically interested in residents’ current use of public Wi-Fi in order to inform expansion to additional locations. The original public Wi-Fi hotspots were placed primarily in parks situated in areas where home adoption rates were lower. According to survey responses, approximately a quarter of respondents (23%) use these public Wi-Fi hotspots on a monthly basis while only 11% use it daily. Furthermore, no significant relationships were found between public location Wi-Fi usage and characteristics such as zip code, subscription type, household income, or race. See Figure 11.

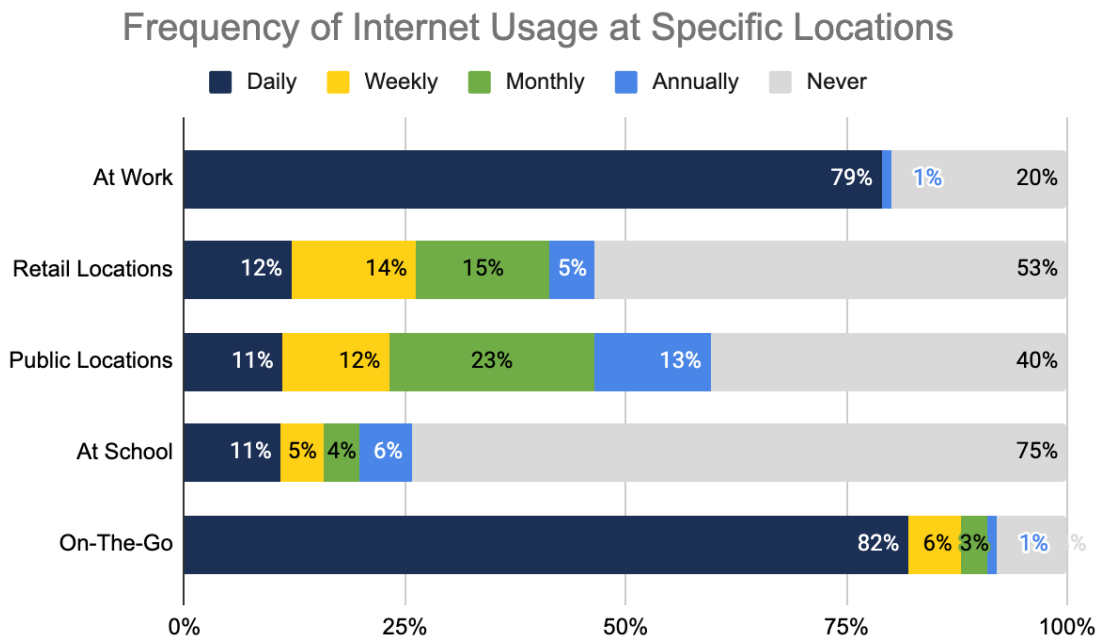


Figure 11

To better understand whether the city’s Internet users were leveraging city-sponsored hotspots, we cross-referenced usage from the survey with location of hotspots. A review of the city’s website identified public Wi-Fi hotspots at six different community centers throughout the city (yellow markers in Figure 12) as well as at nine parks (blue markers in Figure 11). Most of these initial access points were positioned outdoors at the height of the COVID pandemic as a way for students and families to access reliable service to complete remote schooling assignments and activities. Little Rock has since scaled back indoor social distancing requirements as fewer cases of the COVID-19 virus have been reported in recent years.

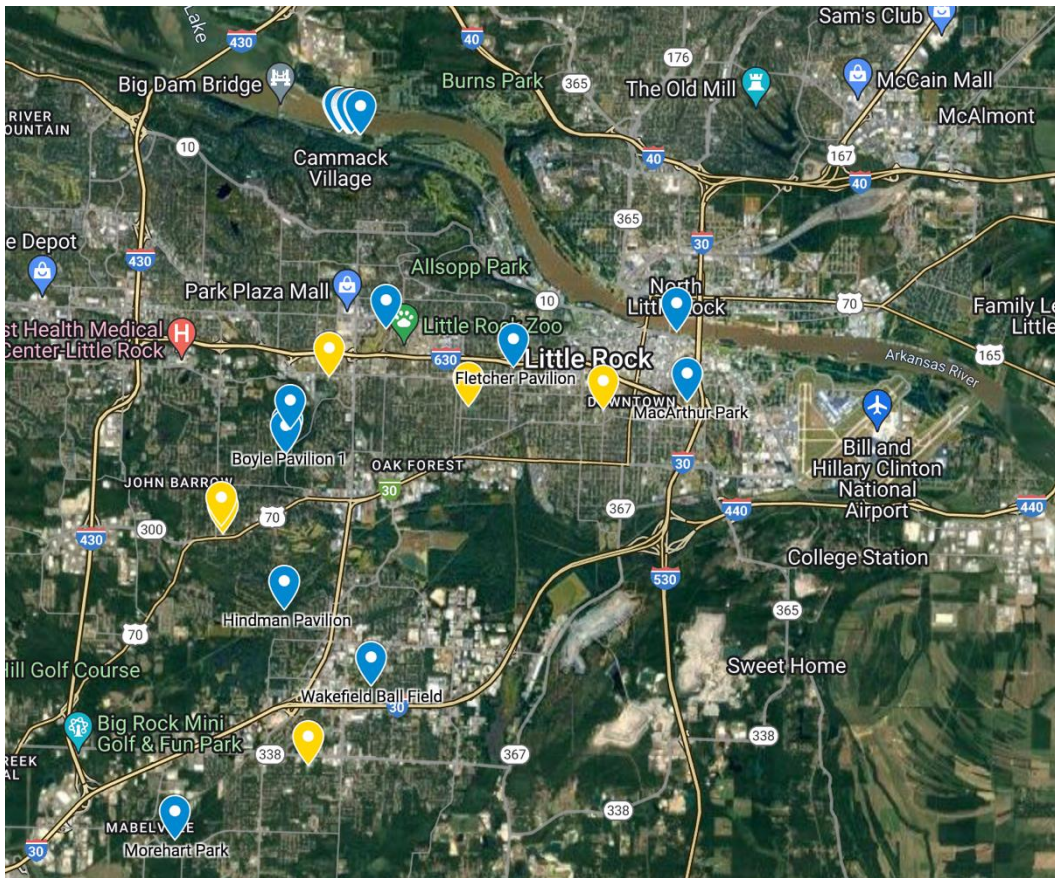


Figure 12

Starting from respondents reported zip codes, we correlated where the city had invested in public Wi-Fi hotspots with the usage reported by survey respondents. The Mayor’s Office had installed hotspots in zip codes 72204, 72209, and 72202. Respondents from zip code 72223 reported the most frequent use of the city-sponsored public locations, which was not a match for where the city had prioritized resources. However, 23% of the total usage reported came from 72202 and 72204, which were locations where the city had hoped residents would make use of public Wi-Fi hotspots.

Table 8. City’s investment into public Wi-Fi hotspots and self-reported usage.

Respondent's Zip Codes	Number of Locations w/ Public Wi-Fi Hotspots	Percent of City's Total Wi-Fi Hotspot Investment	Percent of Respondent's Reported Usage
72118	0	0%	1%
72201	1	7%	4%
72202	3	20%	13%
72204	6	40%	10%
72205	1	7%	7%
72206	0	0%	10%
72207	0	0%	5%

72209	3	20%	5%
72210	0	0%	5%
72211	0	0%	10%
72212	0	0%	7%
72213	0	0%	0%
72220	0	0%	1%
72223	0	0%	17%
72227	0	0%	6%

Lastly, as a way to gauge common internet behaviors, we asked residents to indicate whether they had ever engaged in specific online activities. The following activities had the greatest prevalence of resident interaction: email (100%); online shopping (97%); navigation tools (97%); financial services (96%); social media (96%); video conferencing (94%); and music and video streaming (90%). The least common activities included online gaming (44%), use of a health device (52%), and selling goods online (59%) (see Figure 13). Although this survey question did not ask with what frequency residents participated in these online activities, we were able to ascertain the reasons an individual might be likely to use the internet.

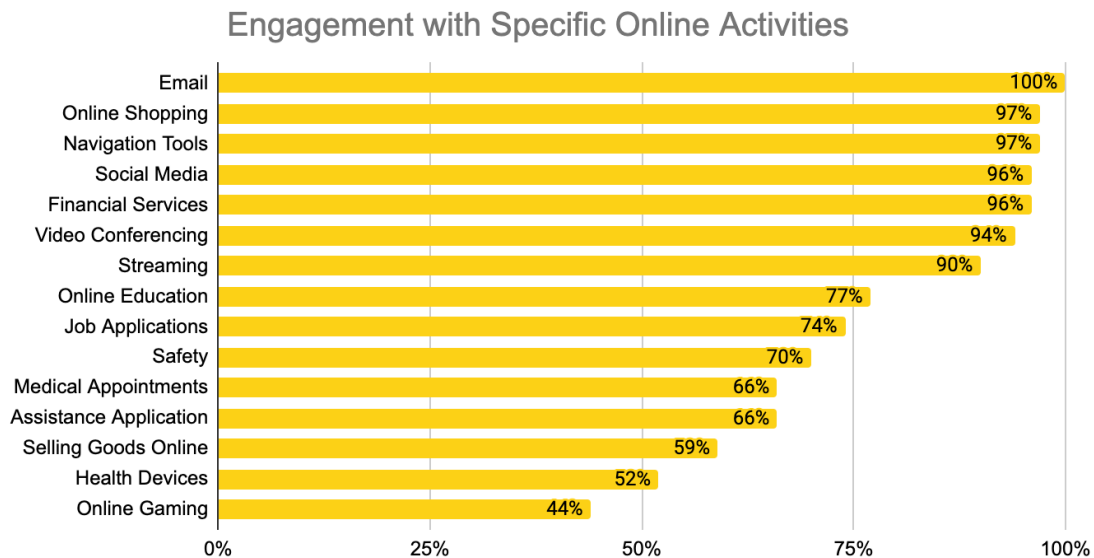


Figure 13

Research Question 3: What is the level of awareness of the internet’s utility and benefits to adopters and non-adopters?

A major finding for level of awareness is that most citizens are aware of the magnitude and scope of online activities, but that there are some gaps between awareness and actual usage. An additional important finding from the survey results was the lack of responses to this question from non-adopters (1%). This limitation will be discussed in more detail below; however, the awareness question was necessary to assess resident’s cultural capital and exposure to a wide

array of online activities. Each named activity had a 90% or greater response rate of awareness, with the exceptions of health devices (89%) and online gaming (88%), though both were still relatively high (Figure 14).

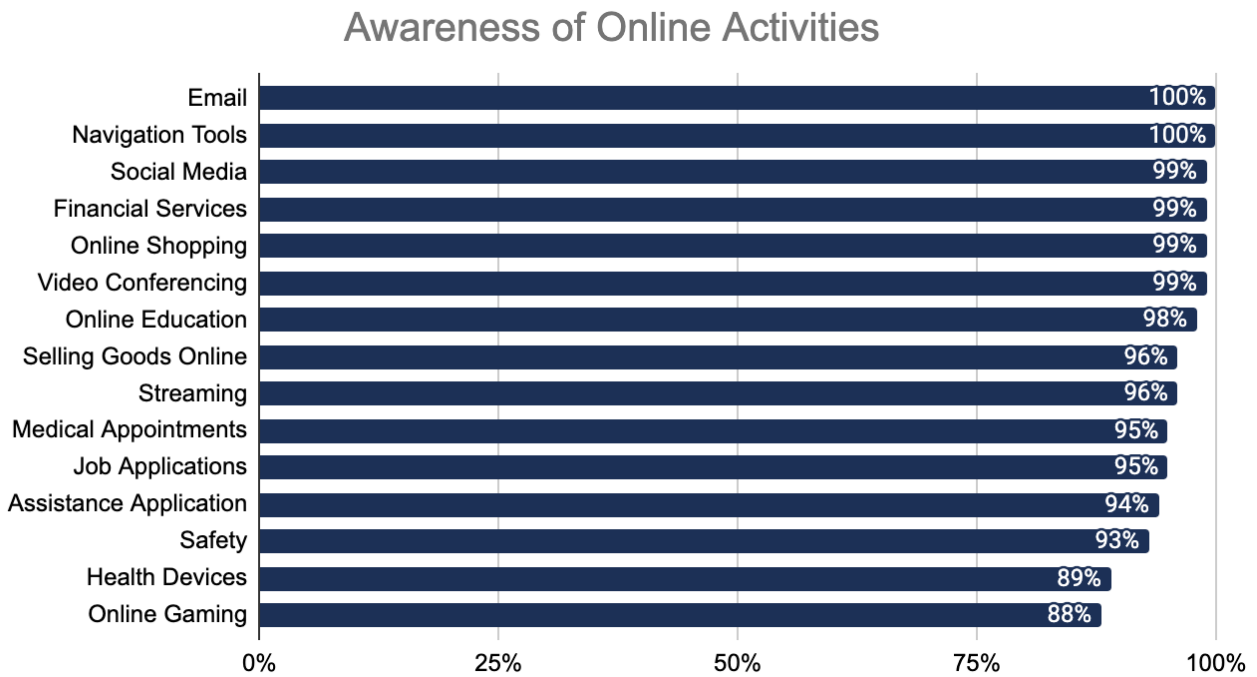


Figure 14

Although we lack significant survey data regarding non-adopters, during our interview session with Constituent Services, the interviewee cited an example where a non-adopter was not comfortable paying bills online: “They were saying they don’t want to pay online their bills and they want the payment centers back, because they don’t feel comfortable going online. You just want to see a face, plus they want to make sure where their money is going” (R. Amponsah, personal interview, December 2022). This led us to explore gaps between awareness of an activity and its actual use. The six least attempted online activities were: online gaming, use of a health device, selling goods online, applying for online assistance, participating in an online medical appointment (telehealth), and using a safety device. We chose to narrow our focus to selling goods online, applying for assistance online, online medical appointments, and safety devices based on hierarchy of needs. For each activity, we identified the space between awareness and actual use for specific groups.

As related to being aware of applying for assistance online and actually applying for assistance, the groups with the largest usage gaps were white respondents (19 points) and respondents between the ages of 31 and 60 (19 points).

Table 9. Awareness-usage gap for applying for government assistance online.

Groups	% of Total Respondents Who Were Aware of Applying for Assistance Online	% of Total Respondents Who Applied for Assistance Online	Awareness – Usage Gap
2-Year Degree/Some College	14%	13%	2%
Bachelors	26%	17%	9%
Doctorate	13%	6%	7%
High School Diploma	6%	5%	1%
Masters	32%	22%	10%
No HS Diploma	1%	1%	0%
Prefer Not to Say	1%	1%	0%
American Indian/Alaska Native	1%	1%	0%
Asian American/Pacific Islander	4%	3%	1%
Black/African American	28%	23%	6%
Hispanic/Latino	9%	6%	3%
Other	1%	1%	0%
Prefer not to say	1%	1%	0%
White	50%	31%	19%
(blank)	1%	1%	1%
<\$20,000	8%	8%	0%
\$21,000 - \$59,000	28%	22%	7%
\$60,000 - \$99,000	21%	14%	6%
>\$100,000	29%	15%	14%
Prefer Not to Say	8%	6%	2%
31 - 60	55%	37%	19%
Older Than 60	30%	22%	9%
Prefer not to say	1%	1%	0%
Younger Than 30	7%	6%	1%

We then looked at respondents awareness of being able to sell goods online and the groups identified as having little engagement with selling goods online. Age and race were the two characteristics that showed the largest awareness-usage gap. For race, white respondents made up 51% of those with awareness but only 32% of respondents who had ever sold goods online, resulting in a 19 point awareness-usage gap. With regards to age, respondents over 60 years made up 33% of all respondents who were aware yet only 13% had sold goods online, yielding a 20 point awareness-usage gap.

Table 10. Awareness-usage gap for selling goods online.

Groups	% of Total Respondents Who Were Aware of Selling Goods Online	% of Total Respondents Who Have Sold Goods Online	Awareness – Usage Gap
2-Year Degree/Some College	14%	7%	7%
Bachelors	24%	17%	7%
Doctorate	14%	8%	6%
High School Diploma	7%	6%	2%
Masters	33%	20%	13%
No HS Diploma	1%	1%	0%
Prefer Not to Say	2%	1%	1%
American Indian/Alaska Native	1%	1%	1%
Asian American/Pacific Islander	4%	4%	0%
Black/African American	28%	16%	13%
Hispanic/Latino	9%	6%	3%
Other	1%	1%	0%
Prefer not to say	1%	0%	1%
White	51%	32%	19%
(blank)	1%	1%	1%
<\$20,000	7%	4%	2%
\$21,000 - \$59,000	29%	21%	8%
\$60,000 - \$99,000	20%	12%	8%
>\$100,000	30%	19%	11%
Prefer Not to Say	10%	4%	7%
31 - 60	55%	41%	14%
Older Than 60	33%	13%	20%
Prefer not to say	1%	0%	1%
Younger Than 30	7%	6%	2%

Next, we examined the awareness-usage gap for using telehealth services. Like selling goods online, the largest gaps were for white respondents (13 points) and respondents between the ages of 31 and 60 (15 points).

Table 11. Awareness-usage gap for participating in a telehealth or online appointment.

Groups	% of Total Respondents Who Were Aware of Online Medical Appointments	% of Total Respondents Who Have Had an Online Medical Appointment	Awareness – Usage Gap
2-Year Degree/Some College	15%	11%	4%
Bachelors	25%	18%	7%
Doctorate	14%	11%	3%

High School Diploma	6%	4%	3%
Masters	32%	21%	11%
No HS Diploma	1%	1%	0%
Prefer Not to Say	1%	1%	1%
American Indian/Alaska Native	1%	1%	1%
Asian American/Pacific Islander	4%	3%	1%
Black/African American	27%	18%	9%
Hispanic/Latino	9%	5%	4%
Other	1%	1%	1%
Prefer not to say	1%	0%	1%
White	51%	38%	13%
(blank)	1%	1%	1%
<\$20,000	7%	8%	-1%
\$21,000 - \$59,000	29%	23%	6%
\$60,000 - \$99,000	20%	11%	9%
>\$100,000	29%	20%	10%
Prefer Not to Say	10%	5%	5%
31 - 60	55%	40%	15%
Older Than 60	32%	20%	12%
Prefer not to say	1%	0%	1%
Younger Than 30	7%	6%	2%

Lastly, driven by a comment made during the interview with Constituent Services, we looked at usage of online safety devices such as a Ring doorbell camera. The interview subject alluded to safety being one of the most common concerns of residents: “I mean in different areas of the city that necessarily don't have cameras, because they don't have businesses. There have definitely been several requests from a safety perspective. It is from a safety perspective because there has been break in and things, and some of the parts when people go jogging or walking, or whatever” (R. Amponsah, personal interview, December 2022). Once again we see white respondents and older respondents having the largest awareness-usage gaps (15 points and 11 points) in the survey groups. An interesting corollary, however, concerns the income category: the earnings bracket with the largest awareness-usage gap (8 points) was respondents with a yearly compensation between \$21,000 and \$60,000.

Table 11. Awareness-usage gap for use of internet enabled home safety devices.

Groups	% of Total Respondents Who Were Aware of Online Safety Devices	% of Total Respondents Who Have Used an Online Safety Device	Awareness – Usage Gap
2-Year Degree/Some College	13%	9%	3%
Bachelors	26%	20%	7%

Doctorate	13%	11%	3%
High School Diploma	6%	6%	-1%
Masters	32%	21%	10%
No HS Diploma	1%	2%	-1%
Prefer Not to Say	1%	1%	1%
American Indian/Alaska Native	1%	1%	0%
Asian American/Pacific Islander	4%	4%	0%
Black/African American	26%	22%	4%
Hispanic/Latino	9%	8%	1%
Other	1%	1%	0%
Prefer not to say	1%	0%	1%
White	50%	35%	15%
(blank)	1%	1%	1%
<\$20,000	7%	7%	0%
\$21,000 - \$59,000	29%	21%	8%
\$60,000 - \$99,000	21%	14%	6%
>\$100,000	28%	25%	3%
Prefer Not to Say	8%	3%	5%
31 - 60	53%	45%	8%
Older Than 60	30%	19%	11%
Prefer not to say	1%	0%	1%
Younger Than 30	9%	6%	2%

Research Question 4: How are various governmental and non-governmental organizations coordinating digital equity efforts and communicating these efforts to residents?

In 2019 Mayor Frank Scott released a strategic plan with the slogan, “Unite Little Rock.” While this strategic plan did not specifically address decreasing the digital divide, it did state: “In particular, the City should consider leveraging information technology, online portals, and the Internet of Things where it will mean better or more efficient service. There is a sense that the City has been lagging in its adoption of new technology” (Scott’s Script, 2019). Thus, the city’s digitization is a cross-cutting concept inclusive of Little Rock’s strategic plan for improving the lives of its residents. As the city brings equity to the forefront of civic conversations, coordination and communication amongst networked organizations has the potential to profoundly impact digital equity initiatives.

From our interviews there emerged three distinct themes: **organizational communication and collaboration; relationship building to promote digital equity efforts; and barriers to stakeholder engagement in the decision making process.** To consider how the themes apply to coordination around digital equity efforts, we have developed a

relationship map that illustrates the type of relationship each entity has with another in its immediate sphere of influence. It is structured to demonstrate an organization's direct or indirect relationship with the Mayor's Office while displaying which level of the digital divide anchors that relationship. The map serves as a visualization of identified themes with particular emphasis upon how relationships are built and sustained through ongoing collaboration opportunities.

Digital Equity Partner Relationship Map

Robert Amponsah | March 12, 2023

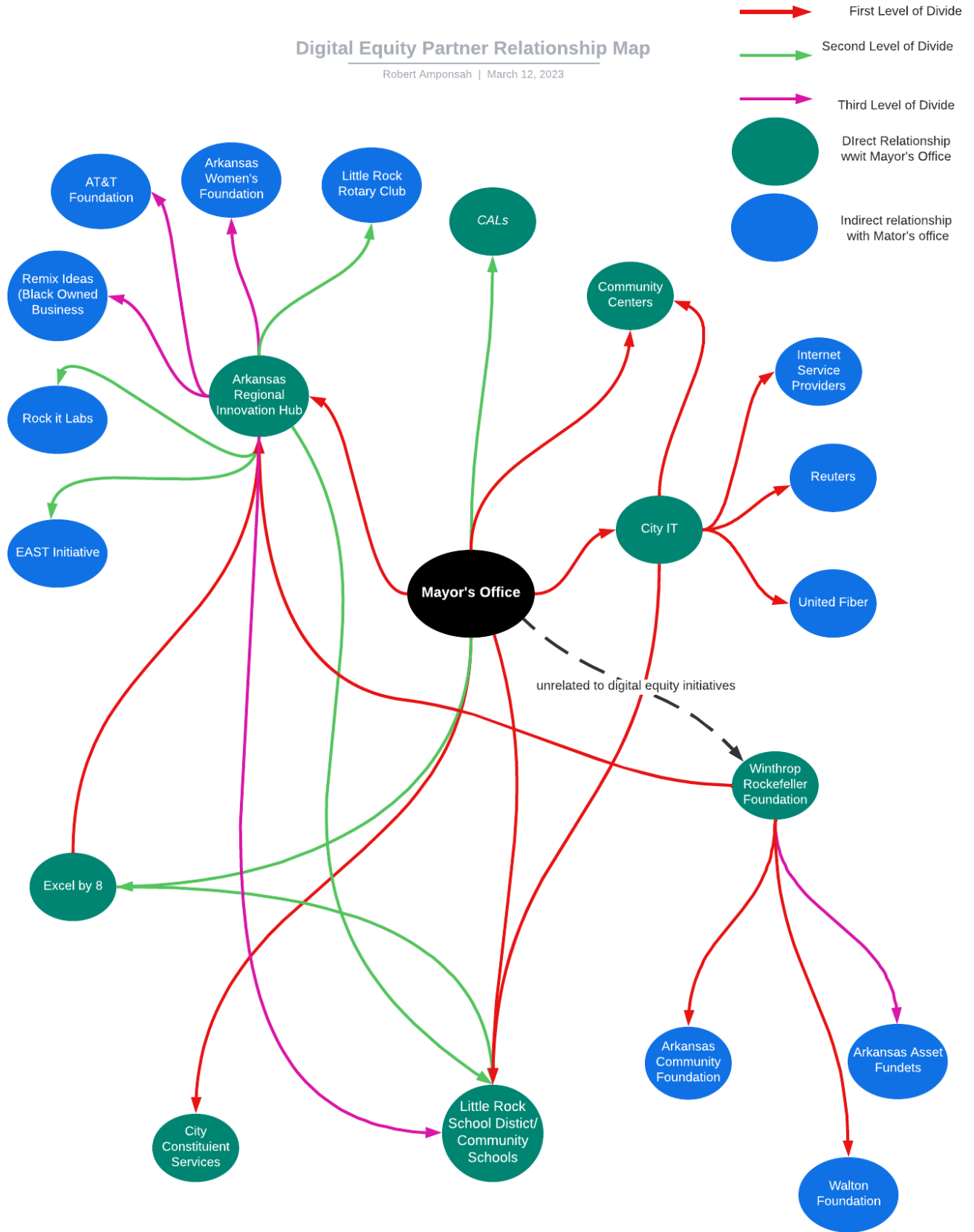


Figure 15

Organizational Communication and Collaboration

A main finding from interviews was that the Mayor's Office is critical in building a common focus on digital equity, although most of the collaborative efforts are focused on the first and second level of digital equity. Most interviewees identified the focus of their relationship on the Mayor's Office department of education. This team was the primary author of the city's digital equity plan, which was created in response to the tech needs that emerged for students and families as a result of the pandemic. During the interview with a member of the Mayor's education department, the interviewee discussed the breadth of Little Rock's digital equity challenges: "I think Little Rock is often overlooked as far as digital equity, and we hear about the rural areas not having access and I understand they have also had significant challenges. But I think there is a lack of awareness that we also have this challenge in Little Rock, and it is not only access to broadband, it is access to devices and even digital literacy" (R. Amponsah, personal interview, December 2022). This assessment, that Little Rock is often overlooked in having digital equity needs, was validated by comments from the Winthrop Rockefeller Foundation interview:

"We know that Arkansas, while we have some good metropolis regions, such as Central Arkansas or Northwest Arkansas. Much of the state is very rural, and a lot of rural locations and cities and towns still don't have internet connections or access to broadband internet. And so, we have been working with other cities, other state agencies, other foundations in rural municipalities to think about, how do we build the infrastructure that our state needs? So that broadband dollars, there's lots of federal money that is coming into various parts of the US, how do we make sure that people in Arkansas who would normally be the last to find out about this, or certainly just not even get the opportunity, how to make sure that there's the infrastructure available to create the broadband expansion? That would then go to those rural communities, because what we know is that if you have a good stable access to Internet. That's a part of being able to be economically empowered to work remotely, to have better jobs, to have access to online learning." (R. Amponsah, personal interview, December 2022).

This quote demonstrates the belief there is only a digital equity need in rural communities, and that more urban areas like Little Rock may not have as much need. This is why collaboration and communication from the Mayor's Office with key stakeholders is critical to dispel the urban-rural digital divide myth.

The Department of Education works closely with the Office of Diversity, Equity, and Inclusion (DEI) to realize equitable digital access across the city. Though the DEI did not directly participate in the creation of the digital equity plan, they are aware of it and have held their own Equity Labs throughout the city as a way to learn more about resident concerns. Their awareness of the city's digital equity plan was made clear during our interview with the office of DEI. The interview subject shared what happened during one of their Equity Labs:

"One of our community members did mention that particularly with the immigrant population, there is a need for digital skill building. They don't even know many of our city services are moving online, and some folks don't even know that when you see blue text, that's a link, you click right. Basic things like that. So, this for us and

thinking about our capacity and the areas in which we've been working, you know, my first reaction when he said that was, we need the city to create a program to do this. So that's when I reached out to [named individual]. And I did a little digging on my own, and I discovered that Central Arkansas Library System, which is great, has a fabulous digital navigator program” (R. Amponsah, personal interview, December 2022).

This response demonstrated that the Mayor’s Office is seen as a resource and a bridge to digital equity resources. However, though the Mayor’s Office is central to many of the digital equity partners, as is evident in Figure 15, most of the relationships only address the digital divide’s first and second levels. This is consistent with the Mayor’s Office digital equity plan.

Through the Office of Education, the Mayor’s Office often collaborates with the Little Rock School District. Thus, when the COVID-19 pandemic shut down city schools, the Mayor’s Office was key in mobilizing resources for families. Simultaneously, the Little Rock School district worked with the Arkansas Regional Innovation (ARI) Hub to conduct a digital equity needs analysis. This shows that the ARI Hub has specific value-add when assessing the state of digital equity within an organization, a key understanding when strategizing how to create the cultural capital necessary to address the third level digital divide. Figure 15 shows how the ARI Hub has many connections to the 3rd level of digital equity, demonstrating the importance of transforming many of the indirect relationships to direct relationships with the Mayor’s Office.

Another finding related to collaboration was that most of the Mayor’s Office relationships are primarily focused on education, with an emphasis on student and parent internet experiences. Through interviews with the ARI and the Winthrop Rockefeller Foundation, it became apparent there is a missed opportunity to think of digital equity beyond the education space. For example, Arkansas Regional Innovation Hub partners with the organization ReMIX Ideas, which is focused on advancing Black entrepreneurship and business ownership. Working with this organization has allowed ARI to understand the organization’s needs and build a strategy that connects usage of digital technologies to improve Black entrepreneurship. Another example is the Mayor’s Office relationship with the city of Little Rock IT department that is working to engage Internet Service Providers (ISP). The IT representative discussed the limitations of the current strategy to engage with internet providers: “...but having a strategy that goes out to a community and picks the community and tries to help that community, to my knowledge, we really don't have that strategy.” With the full support of the Mayor’s Office, the IT department would have additional resources to leverage with ISPs; this is also the hope of the Winthrop Rockefeller Foundation, currently having its own challenges with ISPs. They are struggling with ISP contractual obligations concerning innovating digital equity resources other than internet access.

The Arkansas Regional Innovation Hub, on the other hand, has a relationship with the AT&T Foundation, and has collaborated to address digital equity issues in rural Arkansas beyond just internet access. This is a key learning around engaging ISPs from which all networked organizations could benefit. While there is a multitude of collaboration

happening in and around Little Rock related to the first and second level divide, it is often disjointed. There is opportunity to better connect organizations to enhance learning and pool resources.

Relationship Building to promote Digital Equity Efforts across organizations.

Although there are many partners working on digital equity efforts, a major finding related to promoting those efforts is that there is a lack of infrastructure to provide visibility and communication across organizations. Local organizations external to the Mayor’s Office may have limited collaboration with one another despite similar goals and initiatives. For example, the Arkansas Regional Innovation Hub (ARI) created a digital literacy website at the request of the Little Rock School District. Their curriculum and materials are primarily intended for parents and guardians who want to improve their use of the district’s digital tools. The Central Arkansas Library System (CALs) has a similar program intended to improve the community’s digital literacy skills, albeit embracing a more expansive range of skills. It is unclear to what extent, if at all, these two organizations have worked together, but the CALs program was not referenced during the ARI interview. Furthermore, the Communities Director at Excel by Eight described its mission as:

“Investing in communities and advocating for policy. Removing community barriers to children really being able to thrive. And so, there are lots of resources that children need to thrive, and things like healthy food, access to education from very early on, high quality education. Their parents need access to parenting resources and reliable transportation and good affordable housing. And so, we look at all these aspects within it” (R. Amponsah, personal interview, December 2022).

In this case, similar goals did serve as a catalyst for a relationship between ARI and Excel by Eight, now partnering to design courses for families. Thus, while some organizations/departments collaboration is facilitated through the Mayor’s Office, there are also partnership opportunities developing without support. If the Mayor’s Office intends to monitor digital equity activities aligned to the Little Rock plan, then interviews did not reference an ongoing mechanism for communication and collaboration across these organizations.

Another finding in this area pertains to the Mayor’s Office relationship with the Winthrop Rockefeller Foundation. During an interview with an Equity Officer at the Winthrop Rockefeller Foundation, describing their relationship with the Mayor’s Office, the interviewee stated:

“We have a really good relationship with them. We have actually not engaged very much around broadband connectivity other than that partnership that we did early in the pandemic to provide connectivity around Little Rock. Honestly, until I looked at some of the stuff that you sent over in the numbers. I didn’t realize that there was so many people in Little Rock that still really struggled with wi-fi access, and so we honestly have not done as much with Little Rock. But we absolutely have a wonderful working relationship with Mayor Scott in his office and could do more if the opportunity present itself.” (R. Amponsah, personal interview, December 2022).

The Foundation, however, is participatory in digital equity efforts in rural areas in Arkansas, and has partnered with organizations like the Arkansas Community Foundation to help raise funds to expand broadband access. Based on our interviews, there may be visibility issues with direct and indirect partners of the Mayor's Office that impacts digital equity coordination.

Barriers to Digital Equity Stakeholder Engagement

A final major finding was that language and acquaintance with technology are often barriers to stakeholder engagement. As was noted in one interview, the Hispanic population is one of the least engaged constituent groups for the citywide equity labs. In fact, the subject stated: "Our Spanish-speaking community, culturally, are not those who tend to like to fill out surveys. But this might be helpful, as you all are exploring and working with CALs. They currently have a position open for Director of Equity and Community Outreach." CALs (the Central Arkansas Library system) also noted the low Hispanic participation rate in their digital guide program and digital skill workshops. Notably, while the library offers multilingual support, their website is exclusively in English. Thus, language may prevent some from understanding available opportunities.

The few Hispanic residents who did attend equity labs shared the need for digital literacy opportunities for Hispanic residents, with a particular emphasis on the immigrant population. This reflection went beyond language barriers to suggest that Hispanic residents with limited digital literacy skills were unaware of the city's feedback events as the labs were primarily advertised via social media platforms. Communication methods were not just a struggle for the Hispanic community, though, as enunciated in the Constituent Services interview:

"So, I would send out mass email to all the neighborhood associations within the wards. So, they would come out if they had confirmed that they had issues, if they had kudos, whatever they had, and this was like a different forum, similar to a board meeting. But it just kind of gave them more freedom and more flexibility. Would love to talk about this with someone else, being able to reach out to the different neighborhood associations without having to do a whole ward. The whole city would be lovely if I had some type of text message, because people text more than they do email. People don't look at their email, but they do have their phones all the time." (R. Amponsah, personal interview, December 2022).

Based on this input, there is an opportunity to increase participation from constituents by identifying additional barriers that prevent full engagement. While equity labs were intended to gather in-person input from underserved wards, well-designed digital engagement strategies might amplify participation. Seeking input from disengaged populations is difficult, as referenced here:

"18% of participants were from ward one, which is our most underserved ward. So, one, two, six, and seven are those that are most underserved. So total in total, 18% from ward one, 14% from ward two, 11% from ward seven, and 6% from ward six. I'll add a caveat there. I do believe that we had plenty more from wards six and

seven that were we were unable to report, because we have found often that our immigrant community is not comfortable providing an address when they register. So, actually 35 of our participants did not report their information about their address to allow us to figure out what ward they're in. Another thing we've learned is that most of our residents don't even know what ward they live in. I don't know what ward I was in. I mean I may have been able to guess before I started working at the city and that speaks to a whole other access issue that I've been noodling on. That is an understanding of city government and access to city board meetings that last four hours every week. Even though they're available online, since the pandemic, it still is not accessible to the majority of our population.” (R. Amponsah, personal interview, December 2022).

This quote speaks to immigrant communities that have digital needs and the difficulty in providing them information when they are unable to express those needs, largely because of their discomfort in providing personal contact information. This difficulty extends to the issue of public board meetings. Although the city makes access to board meetings a physical and virtual (online) possibility, those unable to attend in person and who are without a digital gateway are at a severe disadvantage: the inability to receive real-time information about decisions being made that impact their lives and their community, including determinations on achieving digital equity.

Recommendations

Our initial partnership with the Little Rock Mayor's Office centered around creating a stakeholder-informed expansion of the city's public Wi-Fi. However, as the relationship deepened during the data collection phase, the team began thinking more broadly about the overall implementation of Little Rock's digital equity plan. Therefore, the recommendations below relate specifically to findings related to expansion plans as well as continuous improvement considerations for the city's comprehensive plan.

Recommendation 1: Develop a multi-modal citywide Wi-Fi campaign and expand public Wi-Fi hotspots to high-traffic locations throughout the city.

As a result of the survey, we were able to verify that residents have been utilizing the current Wi-Fi hotspots, albeit mostly as a monthly or annual occurrence. As reflected in the zip code usage analysis table in the findings, the group most often utilizing public Wi-Fi doesn't reside in the areas the city targeted for Wi-Fi hotspots. Due to social distancing restrictions in place when hotspots were installed, the vast majority were established in outdoor locations. With distancing restricting now lifted, the survey results may indicate a shift in location needs. In fact, findings demonstrated that “at work” and “on-the-go” were the most cited locations for daily usage of the internet. With this in mind, any expansion efforts should focus on the necessary infrastructure for residents to access the internet while moving about the city.

One option might be to install Wi-Fi in Rock Region Metro, the city's public transit system. This system includes Metro Local, a fixed-bus route network, as well as Metro Streetcar, a rail network. By investing in a free Wi-Fi program on

popular public transit routes, there is the potential to provide internet access for up to 2.5 million passengers each year, thus profoundly impacting the first-level digital divide. Another option might be to identify specific areas within the city that are frequently visited, such as bus/rail stops, malls, or business parks, for hotspot installations.

As the city expands Wi-Fi hotspots, they will need to leverage a multi-modal awareness campaign. Scheerder et al. (2017) pointed out that cultural capital is a motivational determinant for internet usage. Therefore, the city will need to consider how to communicate the program to a stakeholder group with a diverse makeup. As was demonstrated by many of the interviews, choices in language and type of marketing collateral were often barriers to participation. For example, underrepresented groups were less likely to be exposed to social media advertisements. By diversifying the type of collateral used to communicate an expanded Wi-Fi program, the Mayor's Office would reach a broader portion of the population. Additional collateral might include media news spots and flyers distributed via schools, libraries and other non-profit organizations, all the while continuing social media campaigns. These materials should also be available in multiple languages to increase access to information. By strategically leveraging the data to provide on-the-go Wi-Fi options, the Mayor's Office can directly impact the third-level digital divide to ensure underserved groups are able to access the internet's benefits.

Recommendation 2: Hire a full-time Digital Equity Liaison to facilitate ongoing collaboration and progress monitoring of Little Rock's digital equity plan amongst local organizations and Mayor's Office departments.

While the Mayor's Office is the key driver behind the city's digital equity plan, there are a variety of other local organizations that are directly or indirectly working to increase digital inclusion within the city. As was mentioned, many interviewees shared the inefficiencies when communicating and collaborating across organizations. The relationship map (Figure 15) demonstrates the complex network of organizations affiliated with the Mayor's Office. As can be gleaned from this map, there is an opportunity to transition from independent relationships between organizations to a coalition dedicated to addressing Little Rock's digital equity challenges. Champions of these efforts will need a dedicated individual who is able to coordinate collaboration opportunities, augment communication between entities, and focus and monitor the collective impact of the coalition.

At present, the Mayor's Office employs a digital equity intern within the Department of Education. While she has developed and maintained relationships with local organizations, the position is not empowered to facilitate network conventions. To scale Little Rock's digital equity plan, the office should consider a permanent position endowed with sufficient resources to facilitate ongoing engagement amongst organizations. Through interviews, we were able to verify duplicative initiatives and missed opportunities that could, if proctored, be coordinated to enhance digital equity activities. A full-time Digital Equity Liaison would be able to provide a citywide perspective and serve as a connector between organizations. As was identified in the findings, one clear missed opportunity was the absence of shared planning between the Rockefeller Winthrop Foundation and the Mayor's Office as it relates to digital equity. A permanent position would also afford more latitude in the development of long-term digital equity strategies associated with the third-level digital

divide. As was indicated in the findings, Little Rock's work to date has broadly focused on increased access to the internet, devices, and skills. Addressing the third-level requires identifying vulnerable populations and engaging in deeper root cause analysis around the genesis of said gap.

While there was a clear need to focus on school-aged children and approach the work from an educational lens during the pandemic, the city can now widen their reach to other underserved populations. With less time and energy expended on immediate needs (as was necessary during the pandemic), a full-time liaison may be able to proactively engage specific workforce industries as well as healthcare institutions. By working towards a digital equity coalition led by the Mayor's Office, the existing network can be optimized around the first and second level divide, thereby creating opportunity for the Mayor's Office to craft a strategy benefitting the populace now seeing the fewest tangible outcomes of internet use.

Recommendation 3: Create a strategy to utilize the city's existing resident engagement opportunities to survey the needs of target populations.

As was demonstrated by the findings, most survey respondents had access to both an internet capable device and the internet itself. However, those with less education and income were less likely to have devices and a more reliable internet service. The survey results also provided information about the skills gap, which revealed that older residents were less confident in their digital skill abilities. While the survey offered a glimpse at the extent of the first and second-level digital divides in Little Rock, it is an incomplete and ephemeral depiction of the city's digital equity needs. Therefore, to keep a pulse on the needs of the community, the Mayor's Office should explore ways to leverage existing engagement opportunities to collect resident information.

Our interviews with both the Constituent Relations Office and the Chief Equity Officer uncovered limited opportunities to proactively collect feedback from Little Rock residents. Equity Labs were an early initiative, but those have since sunset and were very resource intensive. The Constituent Relations Liaison, on the other hand, has ongoing engagement opportunities with residents as they work to resolve community feedback. The city can leverage this captive subset of the population to implement short, targeted surveys to regularly collect data about digital equity. Another captive group might be potential users of the city's Wi-Fi: users could be directed through a portal to complete an anonymous questionnaire in exchange for being granted access to Wi-Fi. Motivated by a desired outcome, potential users could provide additional demographic and digital equity information that could further the city's understanding of the population's needs. This would be particularly helpful in addressing the third-level digital divide as the city works to better understand the awareness-usage gap identified amongst groups in the findings.

Limitations & Future Research

While this study yielded many interesting findings, there were three primary limitations that should be addressed in future research: the diversity of the sample population; the sample size; and the study's timing and duration. The first limitation relates to the lack of diversity in the sampled population regarding internet adopters and non-adopters. To ensure variety

in the sample, we offered the survey in two languages, provided two survey completion formats, and advertised the survey in an assortment of digital and print mediums. Despite these efforts, 99% of respondents were internet adopters. This meant our analysis was focused on the behaviors of adopters and we could only predict which Little Rock groups might not be represented in the data. After cleaning the data, it was clear that results skewed towards wealthier, older, educated, white women. With the preponderance of previous research related to the impact of the digital divide on lower socioeconomic people of color, future research should develop data collection methods less focused on the transactional nature of a survey and more on a reciprocal experience. One such example might be targeted Equity Labs for Little Rock's Hispanic population, who were one of the least represented groups at previous engagements. Focus group strategies like these could help dig deeper into the root cause of the issues for the demographic groups while empowering the affected communities themselves to develop solutions.

A second limitation was the overall sample size. As of 2021, the Little Rock population was over 200,000 residents. While there were initially over 200 surveys completed, many had to be excluded due to incomplete responses or residency disqualifications. If more people had participated, perhaps this would have ensured a more diverse sample that emulated the city's demographics. Due to the limited sample size, the precision and reliability of findings may have been impacted. Though the survey was widely advertised, future researchers should consider additional strategies to collect data. In previous survey-driven studies, the use of incentives such as raffles have increased participation.

The last limitation was that this study was conducted over an atypical and brief period. Data collection began in late November and concluded in early January. It is likely that the timing of the survey during the holiday season may have contributed to the low participation rate. Furthermore, the data collected only provides a snapshot of digital equity needs at a moment in time for Little Rock. Due to changes in government regulations, funding for broadband, and evolving individual needs, the digital divide is constantly shifting. This was evident in the mayor's initial attempts to reduce the divide by placing Wi-Fi hotspots in outdoor locations. While this may have been a necessity a year ago, today's usage by underrepresented groups is less than expected. To truly address the third-level digital divide, researchers would benefit from an ongoing survey of needs that is continuously being evaluated.

Overall, this study is intended to support the implementation of Little Rock's digital equity plan. The findings should serve as a point of entry for the municipal team to effect changes and monitor results while continuing to explore the drivers behind the gap between internet awareness and usage.

References

- Arkansas Department of Commerce (2020). Arkansas State Broadband Manager's Report. https://broadband.arkansas.gov/wp-content/uploads/2020/07/State-Broadband-Managers-Report-for-June-2020.pdf?utm_source=Newswire&utm_medium=PR&utm_campaign=digitunity-works-with-local-organizations-to-close-arkansas-digital-21842848
- Benton Institute for Broadband & Society (2022). Arkansas Uses Capital Projects Fund to Connect Rural Areas. <https://www.benton.org/blog/arkansas-uses-capital-projects-fund-connect-rural-areas>
- Berger, M., Kuang, M., Jerry, L., & Freund, D. (2022). Impact of the Coronavirus (COVID-19) Pandemic on Public and Private Elementary and Secondary Education in the United States (Preliminary Data): Results from the 2020-21 National Teacher and Principal Survey (NTPS). National Center for Education Statistics
- Brock, R. (2022). New Arkansas Broadband director studying state 'Affordability Trust Fund'. *Talk Business and Politics*. https://talkbusiness.net/2022/09/new-arkansas-broadband-director-studying-state-affordability-trust-fund/?mc_cid=89f435bae0&mc_eid=05771a7647
- Code Advocacy Coalition (2020) State of Computer Science Education: Illuminating Disparities. https://advocacy.code.org/2020_state_of_cs.pdf
- Digiunity (2022). The Second-Level Digital Divide: Insufficient Digital Skills. PR Newswire. <https://www.prnewswire.com/news-releases/the-second-level-digital-divide-insufficient-digital-skills-301456303.html>
- Evans, A. (2019). Who Invented the Internet?. <https://www.history.com/news/who-invented-the-internet>
- Fowler, B. & Vegas, E. (2021) How Arkansas Implemented Its Computer Science Education Program. Brookings Institution. <https://www.brookings.edu/research/how-arkansas-implemented-its-computer-science-education-program/>
- Klein, A. (2021). During COVID-19, Schools Have Made a Mad Dash to 1-to-1 Computing. What Happens Next?. *Education Week*. <https://www.edweek.org/technology/during-covid-19-schools-have-made-a-mad-dash-to-1-to-1-computing-what-happens-next/2021/04>
- McClain, Colleen (2021). 34% of lower-income home broadband users have had trouble paying for their service amid COVID-19. Pew Research Center
- Pew Charitable Trusts (2020). How States are Expanding Broadband Access. https://www.pewtrusts.org/-/media/assets/2020/03/broadband_report0320_final.pdf
- U.S. Bureau of Labor Statistics. (2022). Table 3. <https://www.bls.gov/cps/effects-of-the-coronavirus-covid-19-pandemic.htm>
- Pew Research Center (2021). Internet/Broadband Fact Sheet. <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/#panel-3109350c-8dba-4b7f-ad52-a3e976ab8c8f>
- Scheerder, A. J., Van Deursen, A. J. a. M., & Van Dijk, J. A. (2017). Determinants of Internet skills, uses and outcomes. A systematic review of the second- and third-level digital divide. *Telematics and Informatics*, 34(8), 1607–1624.

van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society*, 21(2), 354–375.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, 36(1), 157–178.

Vogels, E.A. (2021). Some Digital Divides Persist Between Rural, Urban, and Suburban America. Pew Research Center. <https://www.pewresearch.org/fact-tank/2021/08/19/some-digital-divides-persist-between-rural-urban-and-suburban-america/>

Warschauer, M., Knobel, M., & Stone, L. (2004). Technology and Equity in Schooling: Deconstructing the Digital Divide. *Educational Policy*, 18(4), 562–588.

Appendix A

Improving Internet Access in the Little Rock Area

You are invited to participate in a survey about internet use and services in Little Rock, Arkansas. This survey has been developed by two Vanderbilt PhD students in conjunction with the City of Little Rock. The results will let us know how Little Rock residents engage with resources on the internet, where they use it, and what issues people have accessing internet. This survey is anonymous and your data will be safeguarded. We will use the results to improve public Wi-Fi access, develop digital skill workshops, and increase internet services across Little Rock. Your participation will help us make decisions on where to focus improvements.

Are you a resident of Little Rock, Arkansas?

- Yes
- No
- I don't know

Please let us know your zip code:

I identify as:

- Male
- Female
- Non-binary / third gender
- Prefer not to say
- Prefer to self-describe _____

What race/ethnicity do you identify as (mark all that apply):

1. Hispanic/Latino
2. White
3. Black/African American
4. American Indian/Alaska Native
5. Asian American/Pacific Islander

Please provide your age:

- 10 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81+

What is your highest level of education?

- Not a high school diploma
- High School Diploma/ or Equivalent
- Some College
- 2-year Degree (e.g. Associate's degree)
- 4-year Degree (e.g. Bachelor's degree)
- Masters
- Doctorate
- Prefer Not to Say
- Other _____

What is your current employment status?

- Employed
- Unemployed; not looking for work
- Unemployed; looking for work
- Student
- Retired
- Prefer Not to Say

What was your household income in the last year?

- Less than \$20,000
- \$21,000 - \$39,000
- \$40,000 - \$59,000
- \$60,000 - \$79,000
- \$80,000 - \$99,000
- \$100,000 - \$119,000
- More than \$120,000
- Prefer Not to Say

Do you use the internet?

- No
- Yes

If you do not use the internet, please tell us whether you agree or disagree with the following reasons.

	Agree	Disagree
I cannot afford a monthly internet bill.	<input type="radio"/>	<input type="radio"/>
Internet connection in my area is unreliable or too slow.	<input type="radio"/>	<input type="radio"/>
I don't have a device to access the internet.	<input type="radio"/>	<input type="radio"/>

I am concerned about my safety and privacy.	0	0
I am unsure how to use the internet.	0	0
I am unsure about how the internet can help me.	0	0
I choose not to use the internet.	0	0
Other (please specify):	0	0

Do you have access to an internet subscription at home?

- 6. Yes, with a cable or internet provider (AT&T or Comcast)
- 7. Yes, through my mobile phone or a hotspot.
- 8. Yes, with a cable or internet provider and mobile phone or hotspot.
- 9. I don't know.
- 10. I don't have access at home.
- 11. Other: _____

What devices do you have access to at home?

	Yes	No	I don't know
Tablet (Surface Pro, iPad, etc.)	0	0	0
Desktop/Laptop (MacBook, Dell, HP, etc.)	0	0	0
Smart Phone (iPhone, Galaxy, Pixel, etc.)	0	0	0
Smart Appliances (Alexa, Google home, etc.)	0	0	0
Smart TV or streaming device (Roku, Amazon Fire Stick, etc.)	0	0	0
Gaming Console (PlayStation, Xbox, Nintendo Switch, etc.)	0	0	0

If you have the device at home, do you access the internet on it?

	Yes	No	Do Not Have Device
Tablet (Surface Pro, iPad, etc.)	0	0	0
Desktop/Laptop (MacBook, Dell, HP, etc.)	0	0	0

etc.)			
Smart Phone (iPhone, Galaxy, Pixel, etc.)	o	o	o
Smart Appliances (Alexa, Google home, etc.)	o	o	o
Smart TV or streaming device (Roku, Amazon Fire Stick, etc.)	o	o	o
Gaming Console (PlayStation, Xbox, Nintendo Switch, etc.)	o	o	o

Approximately how often do you use the internet in the following locations.

	Never	Annually	Monthly	Weekly	Daily
At work	o	o	o	o	o
At a retail location (Starbucks, McDonalds, Target, etc.)	o	o	o	o	o
At a public location (library, park pavilion, community center, etc.)	o	o	o	o	o
At a school (Pulaski Technical College, University of Arkansas at Little Rock, etc.)	o	o	o	o	o
On-the-go (using a cellular data plan on a mobile device)	o	o	o	o	o

When you use wi-fi in public spaces (Starbucks, libraries, schools, park pavilions, etc.), please let us know if you agree or disagree with the following statements.

	Agree	Disagree
I use public wi-fi because my data plan regularly runs out	0	0
I use public wi-fi because I don't have a data plan or I don't have an unlimited plan	0	0
I use public wi-fi because I cannot afford a monthly home internet bill	0	0
I use public wi-fi because it's more reliable than cellular service	0	0
Other:	0	0

Please let us know if you have ever engaged in the following internet-related or online activities.

	Yes	No	I don't know
Participated in an online educational program	0	0	0
Used social media (Facebook, Instagram, TikTok, etc.)	0	0	0
Used email	0	0	0
Used GPS or navigation tools (Google Maps, Apple Maps, Waze, etc.)	0	0	0
Used financial services (banking, mobile deposit, online payment, Square, etc.)	0	0	0
Applied for government or social assistance online (DMV, unemployment, Medicaid, etc.)	0	0	0
Shopped online (Amazon, eBay, etc.)	0	0	0
Sold goods online (Facebook Marketplace, OfferUp, etc.)	0	0	0
Hosted or participated in an online video call, conference, or meeting (Zoom, Skype, Google Meet, etc.)	0	0	0

Used a health and fitness device (Peloton, Apple Watch, Garmin, etc.)	0	0	0
Had a medical or mental health appointment (online doctor, Better Help, etc.)	0	0	0
Searched for or applied for a job online	0	0	0
Streamed videos or music (Netflix, Hulu, Spotify, Pandora, etc.)	0	0	0
Played games online (Fortnite, multi-player games, etc.)	0	0	0
For safety purposes (Find my iPhone, Ring, Find My Friends, etc.)	0	0	0

Please let us know if you are AWARE the following activities can be done on the internet.

	Yes	No
Participate in an online educational program	0	0
Use social media (Facebook, Instagram, TikTok, etc.)	0	0
Use email	0	0
Use GPS or navigation tools (Google Maps, Apple Maps, Waze, etc.)	0	0
Complete financial services (banking, mobile deposit, online payment, Square, etc.)	0	0
Apply for government or social assistance online (DMV, unemployment, Medicaid, etc.)	0	0
Shop online (Amazon, eBay, etc.)	0	0
Sell goods online (Facebook Marketplace, OfferUp, etc.)	0	0
Host or participate in an online video call, conference, or	0	0

meeting (Zoom, Skype, etc.)		
Use a health and fitness device (Peloton, Apple Watch, Garmin, etc.)	<input type="radio"/>	<input type="radio"/>
Have a medical or mental health appointment (online doctor, Better Help, etc.)	<input type="radio"/>	<input type="radio"/>
Search for or apply for a job online	<input type="radio"/>	<input type="radio"/>
Stream videos or music (Netflix, Hulu, Spotify, Pandora, etc.)	<input type="radio"/>	<input type="radio"/>
Play games online (Fortnite, multi-player games, etc.)	<input type="radio"/>	<input type="radio"/>
For safety purposes (Find my iPhone, Ring, Find My Friends, etc.)	<input type="radio"/>	<input type="radio"/>

How would you rate your skill level using the internet?

- Basic Skills
- Intermediate Skills
- Expert Skills

How important is the internet in your life?

- Not at all important
- Somewhat important
- Very important

Appendix B

Organization Interview Protocol

1. Can you describe your organization and the top priorities for the community you serve?
2. What current initiatives, goals, and outcomes does your organization have specifically around digital equity?
3. What does success look like in the digital equity space for your organization and the stakeholders you serve?
4. What community feedback have you received and how is that incorporated into future initiatives?
5. What new opportunities has your organization identified around improving digital equity?
6. Does your organization have a roadmap of activities that need to take place to achieve digital equity goals?
7. What other organizations have you partnered with to achieve your digital equity goals?
8. What are the characteristics that are considered when selecting partners?
9. Are there potential partners the organization is looking to engage to help with current and future efforts?
10. What are the attributes that identify the current communities of focus to improve digital equity?
11. What metrics are used to determine underserved and unserved communities for your organization?
12. Can you describe the feedback model used to understand your communities' needs?
13. What is the community's perception of how your organization is addressing digital equity?
14. How is the community involved in development of digital equity initiatives and who are those key stakeholders?
15. With the current initiatives, what have been some of your key learnings?
16. Can you describe the engagement model used to understand your communities' needs?
17. What are the preferred communication tools used to communicate with the community and how does the community engage your organization?
18. Can you please describe how digital equity efforts are marketed and distributed to the community?
19. Can you describe the response and how the community has responded to the current marketing efforts?
20. What are the specific metrics of success around digital equity for your organization?
21. The following diagram describes potential contributing factors impacting utilization of the internet inside and outside of the home. After examining the below diagram, what are some additional insights that you could provide?

