Strengthening Broadband through Library Engagement: Libraries as Critical Infrastructure Intermediaries

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ABSTRACT

In the Pittsburgh region, the Every1online project, led by the non-profit Meta Mesh, bridges communities with no-cost Internet service. Recognizing that digital literacy is a core component of digital inclusion, the authors worked with Meta Mesh to consider the digital literacy needs of community members and to be responsive to these needs through resources provided to individuals as their Internet connection is established. To build an understanding of these digital literacy needs, the research team surveyed librarians to discover the questions that patrons bring to the library. In this paper, we propose that libraries both provide essential *social infrastructure* and, as evidenced by this case study, serve as important intermediaries to *critical infrastructure*. We introduce the concept of a *critical infrastructure intermediary*, an organization or individual that helps people to find and use critical infrastructure and that helps to strengthen that infrastructure through a feedback loop.

ALISE RESEARCH TAXONOMY TOPICS

public libraries; community engagement; political economy of the information society

AUTHOR KEYWORDS

digital divide; digital inclusion; digital literacy; infrastructure; intermediary

INTRODUCTION

In the Pittsburgh region, the Every1online project, led by the non-profit wireless internet service provider (WISP) Meta Mesh, bridges communities with no-cost Internet service. Recognizing that digital literacy is a core component of digital inclusion efforts, the authors worked with Meta Mesh to explore the digital literacy needs of community members and to be responsive to these needs through resources provided to individuals when their Internet connection is established. To build an understanding of these literacy needs, our team surveyed librarians to discover the digital literacy needs that patrons bring to librarians.

For the Every1online project, this survey data informed the development of a digital literacy resource shared with clients as they get connected. The survey provided an opportunity to raise awareness about the Every1online project among librarians who, in turn, can refer their patrons to this service. Through this case study, this paper proposes that libraries both provide essential *social infrastructure* (Klinenberg, 2018) and serve as intermediaries to the *critical infrastructure* like broadband. We introduce the idea of a *critical infrastructure intermediary*, an organization or individual that helps people to find and use critical infrastructure and that helps to strengthen that infrastructure through a feedback loop.

BACKGROUND

Dimensions of the Digital Divide

The digital divide is broadly understood as the inequalities in the access to and use of information and communication technology. While writing in the 1990s and early 2000s focused on the digital divide as the gap in access to personal computers or the Internet, policy makers, community advocates, researchers, and others have recognized this as only one dimension of a layered challenge (Chen, 2013).

The focus on access to ICTs is often characterized as the "first-level digital divide" (Dewan and Riggins, 2005; Aissaoui, 2020). A "second-level" of the digital divide concerns the disparities the digital literacies needed to make use of and benefit from technologies and the Internet (Hargittai, 2001; Van Dijk, 2012; Acharya et al., 2017). Since 2011, studies have also proposed a "third-level" digital divide that focuses on the tangible outcomes and benefits of Internet use (Wei et al., 2011; Scheerder et al., 2017).

Libraries and the Digital Divide

As the Internet and digital tools have become key to an individual's management of their healthcare, education, civic engagement and more, libraries have identified expanded access to digital technologies and digital literacy as essential for communities (Clark and Perry, 2015). Researchers and stakeholders agree that public libraries play a critical role in bridging the digital divide (Aqili and Moghaddam, 2008; Kinney, 2010; Jaeger et al., 2012). Library responses to the digital divide, characterized as "digital inclusion" efforts, include both policies and actions that improve access to the Internet and devices and "the skills and abilities necessary for access once the technology is available" (Real et al., 2014, p.8).

One of the most substantial investigations of library digital inclusion efforts is a 2014 survey managed by the ALA Office for Research & Statistics and the Information Policy and Access Center at the University of Maryland. The study team received 2,304 responses from public libraries, with the results suggesting widespread library WiFi access and affirming "that digital information and skills are now woven into most all library services (Clark and Perry, 2015, p. 2). The 2014 survey found that "virtually all libraries (98 percent) offer free public Wi-Fi access" and

that “close to 90 percent of libraries offer basic digital literacy training” (American Libraries Association, 2015).

During the COVID-19 pandemic, libraries broadened digital inclusion efforts that address both first- and second-levels of the digital divide. In March 2022, the American Libraries Association provided an exploration of the strategies that libraries put into place to serve their communities, even when their physical spaces were closed. Libraries acted rapidly, keeping “communities connected during the COVID-19 pandemic by providing outdoor Wi-Fi, hotspot lending, and virtual and in-building resources and technology support” (Bryne and Visser, 2022, p. 1).

Intermediary Roles

In his book *Palaces for the People,* sociologist Eric Klinenberg (2018) advances the concept of *social infrastructure*, “the physical spaces and organizations that shape the way people interact” (p. 5). In this paper, we recognize libraries as key components of our social infrastructure and, indeed, libraries’ COVID-19 responses illustrated their vital societal role. In addition to being part of our social infrastructure, this paper maintains that libraries are important *intermediaries* to what has been characterized by some as “critical infrastructure,” the hard or physical infrastructure like our transit system, electricity grid, and, pertinent to this paper, broadband (Klinenberg, 2018, p. 15).

The term “intermediary” has been used in the context of civic, or community, datasets. A civic information or data intermediary serves “as a mediator between data and local stakeholders.” (Hendey et al., 2016, p. 6). The Western Pennsylvania Regional Data Center, a Pittsburgh-based data intermediary, tells us that “[i]nformation intermediaries help people find and use information to improve their communities" (2017). This intermediary work may involve acquiring and assembling civic data, preparing the data to be shared, managing an open data portal, disseminating civic data online, and helping the community to make use of this data

(Hendey et al.).

As organizations that serve as a connector between people and information, there is a recognition that libraries are valuable civic information or data intermediaries. This intermediary work can take multiple forms, from managing open data portals, providing data literacy training, or referring community members to data through reference work (Civic Switchboard, 2019). There is feedback and support that libraries can provide other data intermediaries; in Pittsburgh, for example, the public and academic libraries provided consultative support and collaboration to the Western Pennsylvania Regional Data Center on metadata and on data literacy training (Civic Switchboard, 2017).

This paper asserts that libraries’ engagement in digital inclusion efforts reveals another intermediary role. In addition to and, indeed, because they are essential components of our social infrastructure, libraries serve as valuable intermediaries to critical infrastructure. In turn, there is

an opportunity for library science educators to conceptualize how to prepare emergent library workers for roles as infrastructure intermediaries.

PROJECT

Meta Mesh is a Pittsburgh-based non-profit wireless internet service provider (or WISP). The non-profit works with collaborators to connect community members to Wifi access at no cost. Meta Mesh and partners use mesh technology, a network of "high-powered, long-distance radios that can transmit bandwidths from connection hubs," sharing, for example, University broadband access to residential homes (Burkholder, 2021). *Every1online* is a Meta Mesh pilot program to provide free wireless to three Pittsburgh-area neighborhoods. Following this pilot period, Meta Mesh will expand the access to other clients in other communities in Western Pennsylvania. The goals of this project are social justice-oriented; "'Every1online is one way to begin to see internet access as a human right' " (Spice, 2020). The authors, as individuals with telecommunications and library and information science expertise, are members of the collaboration supporting the project. This collaboration involves representatives from our local library systems.

Recognizing that the digital divide is multi-layered and involves addressing both the "first-level" of inequitable access to broadband and devices and the "second-level" of digital literacies needs, our team proposed incorporating a "second-level" component to the Every1online project: a digital literacy resource, provided to Every1online users as a paper-based guide when they were connected to Meta Mesh. To build this companion resource, we surveyed the local library community and incorporated existing digital literacy resources created by members of the library community.

Survey of Libraries

Libraries have played central roles in addressing the multi-layered challenge of the digital divide. To meet our goal of providing a guide to Every1online users, we surveyed local libraries to learn about the digital needs in our community. We received IRB approval for the survey in February 2021 and collaborated with the Allegheny County Library Association to disseminate a Qualtrics survey to directors of member libraries. We asked for one representative from member libraries to complete the survey. Of the 46 member libraries, we received 13 completed responses. While a small sample, the data provided us a lens into digital literacy needs in our community and, in turn, among potential users of the Every1online program.

In the survey, we asked librarians about their organization's digital inclusion efforts and about the digital literacy topics they receive from patrons. Libraries' digital inclusion efforts targeted both the first- and second-level of the digital divide (Table 1).

Table 1

Reported Library Digital Inclusion Efforts

Digital Inclusion Service	Number of Respondents
Providing public WiFi (in parking lot or with an extender)	11
Loaning devices and hotspots	8
Providing digital skills reference material (booklet, online guides)	7
Conducting digital literacy and skills workshops	7

Survey respondents indicated that digital literacy needs most often arrive to the library as in-person reference questions (12 of 13 respondents). Only one library indicated that patrons most commonly bring digital literacy needs to the library via phone and no respondents reported online contact as the most common mode. This data affirmed our team's plan to develop a paper-based resource to be given to Every1online clients at the time-of-service establishment.

The survey data highlighted digital literacy needs that patrons bring to libraries.On a scale from 1 to 4, with 1 being "never" and 4 "being often," we found the digital literacy needs most commonly brought to libraries (a mean of 3 and above) include:

- Applying for jobs online (mean 3.92)
- Emailing (3.69)
- Using social media (3.54)
- Using government services and information (3.46)
- Using Microsoft Office or other productivity suites (3.46)
- Accessing the Internet or using basic search engines (3.46)
- Managing personal finances (3.08)
- Basic computer skills (3.00)

This insight guided the "second-level digital divide" support we incorporated into the Every1online pilot.

Use of Survey Data

We used this data to gain a high-level picture of the needs of the community, determining that the digital literacy needs of library users could provide us with an understanding of potential digital literacy needs of Every1online users. While we found that we would need additional clarity about needs related to government services and information and managing personal finances, we determined that we could provide a beginning point for many of these digital literacy needs in a paper-based resource provided to Every1online users (Table 2). We drew from existing resources that the library community has created: the Public Library Association's

DigitalLearn.org materials, which are available for reuse and adaptation through a Creative Commons license. As more users get connected with Meta Mesh, we plan to get feedback on this resource and iterate to address gaps or remove guidance that users do not feel is needed.

Table 2

Sections and Associated Topics in the Meta Mesh Digital Literacy Guide

Guide Sections	Example Section Topics
Computer Basics	Introduction to parts of a computer, turning a computer off an on; copying and pasting; saving files
Going Online	Connecting to the Internet; using a search engine; protecting privacy online; creating an email account
Productivity Tools	Getting started with Microsoft Office and Google Drive
Telehealth	Using local healthcare telehealth system
Video or Conferencing Tools	Crating and joining online meetings
Social Media	Creating social media accounts
Job Portals	Available job portals; constructing a job search
Further Resources	Information about library services

DISCUSSION

The Civic Switchboard project and others propose that libraries have valuable contributions to make as civic data intermediaries. In this paper, we maintain that libraries, through their essential digital inclusion activities, are serving another important intermediary role as critical infrastructure intermediaries. A *critical infrastructure intermediary* is an organization or individual that helps people to find and use critical infrastructure and that helps to strengthen that infrastructure through a feedback loop.

In addition to being vital components of our social infrastructure, libraries serve as key intermediaries to critical infrastructure. Through their "first-level" digital divide response, public libraries are serving as intermediaries between critical infrastructure and users. During the COVID-19 pandemic, libraries have identified ways that this critical infrastructure can have broader reach, by strengthening WiFi signals and offering hotspot lending programs.

Through this project, we identified other examples of libraries as infrastructure intermediaries. Libraries, as essential components of our social infrastructure, can raise awareness about digital equity efforts that take the form of critical infrastructure. We used the survey as an opportunity to inform libraries about the availability of the Every1Online project, recognizing that libraries serve as a critical conduit between the service and users. This connecting work is a valuable intermediary role that can broaden the reach and impact of a WISP. We also recognized libraries' provision of digital literacy support to be intermediary work. Just as data intermediaries help people make use of data about their communities, infrastructure intermediaries help people leverage critical infrastructure to address their needs.

Moreover, libraries as infrastructure intermediaries can improve the infrastructure itself. By participating in the survey of digital literacy needs, libraries offered insight into how users engage with broadband and the challenges that they most commonly encounter. We were able to incorporate digital literacy resources created by library professionals to build the guide provided to Every1Online users. Through the librarians' pulse on community members' needs and the digital literacy resources that the library community already crafted, we were able to strengthen the services that Meta Mesh, as the critical infrastructure provider, is able to offer alongside WiFi access.

CONCLUSION

In addition to being vital components of our social infrastructure (Klinenberg, 2018), libraries serve as important intermediaries to critical infrastructure. This project considers this infrastructure intermediary role as it relates to the technical infrastructure of broadband and overviews a case study in which we learned from public libraries to improve a WISP service.

As a central component of our social infrastructure, we can consider and examine how library work connects to and has the potential to strengthen other examples of critical infrastructure – our transit system, agriculture, and water supply. There is an opportunity to explore this framing of libraries as infrastructure intermediaries in other contexts and, in turn, consider how to make these intermediary roles most impactful for our communities. Moreover, as LIS instructors, there is an opportunity to prepare students with not only a conceptual understanding of digital equity and digital inclusion strategies, but also strategies for developing meaningful and equitable partnerships with community organizations and stakeholders similarly engaged in local infrastructure intermediary work.

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REFERENCES

Acharya, B. (2017). Conceptual evolution of the digital divide: A systematic review of the literature over a period of five years (2010-2015). *World of media: Journal of Russian Media and Journalism Studies*, 1, 41-74. http://hdl.handle.net/10393/36756

Aissaoui, N. (2021). The digital divide: a literature review and some directions for future research in light of COVID-19. *Global Knowledge, Memory and Communication*, Ahead-of-print(ahead-of-print). https://doi.org/10.1108/GKMC-06-2020-0075

American Libraries Association (2015, October 14). New research highlights libraries' expanded roles: ALA News. American Libraries Association. https://www.ala.org/news/press-releases/2015/10/new-research-highlights-libraries-expan ded-roles

Bryne, A. & Visser, M. (2022, March). *Keeping communities connected: Library broadband services during the COVID-19 pandemic.* American Libraries Association. https://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/telecom/broadband/Keeping_Communities_Connected_030722.pdf

Chen, W. (2013). The implications of social capital for the digital divides in America. *The Information Society*, 29(1), 13-25. https://doi.org/10.1080/01972243.2012.739265

Civic Switchboard Team (2017, December 11). *Introducing Civic Switchboard: Connecting Libraries and Community Information Networks.* Civic Switchboard. https://civic-switchboard.github.io/post_1/

Civic Switchboard Project Team (2019). Civic Switchboard Guide. https://civicswitchboard.gitbook.io/guide.

Clark, L. & Perry, K. A. (2015). *After access: Libraries & digital empowerment*. American Libraries Association. https://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/ALA%20DI%20After%20Access_final_12%2017%2015.pdf

Dewan, S., & Riggins, F. J. (2005). The digital divide: Current and future research directions. *Journal of the Association for information systems*, 6(12), 298-337. https://aisel.aisnet.org/jais/vol6/iss12/13

Gendall, J. (2020, September 29). *COVID-19 has shown we all need public space more than ever*. Knight Foundation. https://knightfoundation.org/articles/covid-has-shown-we-all-need-public-space-more-tha n-ever/

Hargittai, E., & Hinnant, A. (2008). Digital inequality: Differences in young adults' use of the Internet. *Communication research*, 35(5), 602-621. https://doi.org/10.1177%2F0093650208321782

Hendey, L., Cowan, J., Kingsley, G. T. & Pettit, K. L.S. (2016). *NNIP'S guide to starting a local data intermediary.* National Neighborhood Indicators Partnership. https://www.urban.org/sites/default/files/publication/80901/2000798-NNIP's-Guide-to-Star ting-a-Local-Data-Intermediary.pdf

Klinenberg, E. (2018). *Palaces for the people: How social infrastructure can help fight inequality, polarization, and the decline of civic life.* Broadway Books.

Real, B., Bertot, J. C., and Jaeger, P. T. (2014). Rural public libraries and digital inclusion: Issues and challenges. *Information Technology and Libraries*, 33(1), 6-24. https://doi.org/10.6017/ital.v33i1.5141

Scheerder, A., Van Deursen, A., & Van Dijk, J. (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. https://doi.org/10.1016/j.tele.2017.07.007

Van Dijk, J. A. (2012). The evolution of the digital divide-the digital divide turns to inequality of skills and usage. In J. Bus, M. Crompton, M. Hildebrandt, G. Metakides (Eds.) *Digital enlightenment yearbook 2012* (pp. 57-75). IOS Press.

Wei, K. K., Teo, H. H., Chan, H. C., & Tan, B. C. (2011). Conceptualizing and testing a social cognitive model of the digital divide. *Information Systems Research*, 22(1), 170-187. https://www.jstor.org/stable/23015630

Western Pennsylvania Regional Data Center (2017). *About*. Western Pennsylvania Regional Data Center. http://www.wprdc.org/about/