Broadband Coverage and Social Transition in Rural Communities

Yunfei Du, University of North Texas

Abstract
Rural and small communities in the United States are often hindered by limited budget and support from smaller tax-bases, which in turn results in higher cost of information infrastructure development and operation. This paper addresses a possible model of the impact of broadband coverage (such as ADSL, Wire, Cable, and Fiber Optic) to social transition in rural areas. Open data on US broadband and interview data were presented. Coverage on rural Texas was illustrated in this paper.
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Contact: ydu@unt.edu

1 Introduction

According to census data, twenty-percent of populations live in rural areas, or communities with populations fewer than 25,000, but rural areas cover eighty-four percent of US territories (United States Census Bureau, 2010). Unlike other populated areas, information infrastructure, particular broadband Internet, is still under-developed in rural America. National broadband map data show large portion of US with no connection of broadband Internet via DSL, Cable, and Fiber Optic, and most area are covered under wireless mobile Internet connections (Broadbandmap.gov).

According to Hendersen (2009), rural communities need technology-related support such as a broadband Internet connection, computers, and electronic resources. In recent years, federal support has increased for rural library facilities and technology related personnel training. Such increased support has the potential to change the daily lives in rural and remote areas, increase the quality of life, and make social transition of rural libraries and information centers.

An example of federally funded projects in rural communities is the Broadband Technology Opportunities Program (BTOP) by the National Telecommunications and Information Administration (NTIA). Through the BTOP program, libraries are becoming public computer centers, providing Internet access to the public; they can "improve the online learning experience and even allow interactive classes" (Thibodeau, 2010, p. 15). Furthermore, the United States Department of Agriculture has been funding the construction or remodeling of rural library buildings through loans and grants, and the Institute of Museum and Library Services (IMLS) has supported both educational programs and projects to provide broadband facilities in rural libraries. IMLS held a public hearing in April 2014 and suggested broadband enhances local economic development and helps residents training themselves and seeking job opportunities online. IMLS also reported the success of libraries and schools on taking the advantage of E-rate, a subsidized Internet program, and on linking the communities to the outside world.

So far, there is few research on how broadband Internet has impacted lives in rural communities, particularly in terms of reducing digital divide through rural libraries. This paper focuses on the following questions:
1) To what extent can broadband Internet coverage enhance the community information needs?
2) To what extent can broadband Internet coverage promote more community interactions with libraries?

2 Review of Related Work

Rural Libraries as Community Information Anchors. Studies suggest information technology infrastructure may greatly empower the role of libraries in rural communities as technology centers. Alemanne, Mandel, and McClure (2011) commended rural libraries' new role of "anchor institutions of the anchor institutions". They suggested librarians and information professionals have the knowledge, credibility, visibility, and community in their communities. Such community trust may enable rural libraries transform from traditional book lending places to community learning centers, knowledge hubs, and technology stakeholders in rural communities. As the same time, information infrastructures will enable libraries to perform traditional information roles such as helping the community with access to e-government, economic development, information technology training, and online job applications.

Digital Inclusion and Broadband Coverage. Many public rural libraries' effort on computer training to general public includes using basic computers, emails, and accessing the Internet. Hoffman, Bertot, & Davis (2012) found 77.3% percent of rural libraries offer informal point-of-use assistance on technologies and 25.2% report offering formal training classes. IMLS research suggested hardware development such as broadband Internet access is the foundation of embracing digital inclusion to underserved population. Digital inclusion addressed individuals and groups' access and use information and communication technologies. "Digital inclusion encompasses not only access to the Internet but also the availability of hardware and software; relevant content and services; and training for the digital literacy skills required for effective use of information and communication technologies" (IMLS, 2014).

Community-based Broadband Modeling. The first step of estimating the impact of broadband Internet to community life is to measure broadband coverage, such wire line capacity at basic speeds, and mobile wireless access. Connected Nation's Broadband Readiness Index uses the National Telecommunications and Information Administration's National Broadband Map county data to focus on three key metrics: wire line capacity at basic speeds, mobile wireless access, and high-capacity speeds greater than 50 Mbps (Connected Nation, 2011).

A model that incorporates factors of community attributes and community needs is the Community-based Broadband Measuring Index by Carmichael, McClure, Mandel, & Mardis (2012, p. 2454). In this model, four factors are considered: community base, community-based needs assessment, community-based planning and deployment, and outcomes assessment. Mandel, Alemanne, and McClure (2012) also suggested that situational factors may impact broadband adoption in terms of both enablers and barriers, which include administrative support, funding, broadband availability, and knowledge on broadband. The model seems a plausible model in research that looks at the impact of broadband Internet to community life and transition.

3 Methodology

The scope of this study is limited to rural communities in Texas. Texas is the second populous State and has over 25 million residents and it is second largest only behind Alaska. The population distribution in Texas is similar to that of the United States, with most people living in urban and suburban areas and along Interstate-35 highway from north to sound along major cities such as Houston, San Antonio, Austin, and Dallas/Fort Worth. The other benefit of looking at Texas is the potential of gaining support from the State and local cities or private support in future projects related to broadband studies.

In addition, broadbandmap.gov has online mapping tools that can generate broadband coverage map easily. Data from Broadbandmap.gov are available to download as Microsoft Excel files for further analysis. Furthermore,

Finally, this project also interviewed 55 library directors in North, Central, South, and West Texas areas in Fall 2013. The interview was recorded as audio files and answers related to broadband and library technologies were analyzed.

4 Preliminary Results and Future Work

The following broadband map illustrates the coverage in the State of Texas. It was generated using national database from broadbandmap.gov (see Figure1). From Figure 1, one can see broadband areas, those with connections such as ADSL, Wire, Cable, and Fiber Optic, all cluster around major cities, such as Dallas, Houston, Austin, San Antonio, Lubbuck, etc., but vast areas in west Texas from Odessa to El Paso as well as Texas panhandle area near Amarillo, have much fewer broadband coverage.

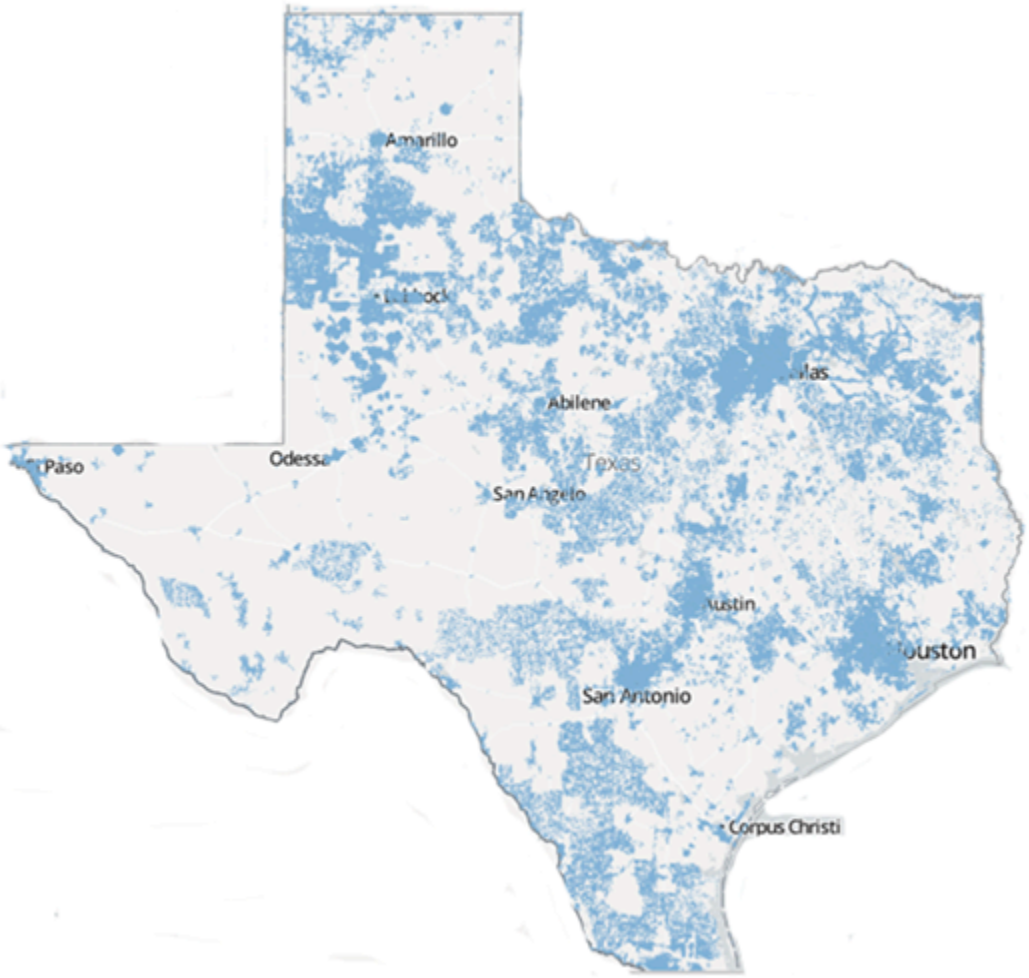

Figure 1. The State of Texas Broadband Coverage

A pilot interview session with rural library directors was conducted to understand broadband Internet coverage and social transitions in rural libraries. The following paragraphs are some of the feedback:

> "I have worked in elementary school, and already know a lot of people through kids. I talked a lot to people about what is going on with library. I told people I used the funding to replace computers and we provide WIFI in our library. For some people who live far from town, they don't have access to the Internet, and the only thing they can use is satellite; however satellite is expensive to some people. We are small, so we don't have time limits of using computer nor require login."

> "The problem is the people who control money has the Internet, they can purchase books and movies when there is a need. They are not looking for job and trying to get better education. They don't always understand the needs to such a large community. It was good for them to see (how libraries support public Internet connection)."

Preliminary data suggest even in the rural communities, there is an inequity between affluent individuals and those who cannot afford the Internet but rely on public connections. This leads to future work on rural library infrastructure studies, librarian education on technologies, and library outreach and collaboration with other community partners.

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