Keeping Promises:Municipal Communities Struggle to Fulfill Promises to Narrow the Digital Divide with Municipal-Community Wireless Networks

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Abstract

Some public elites assert that the digital divide is a serious social problem and that governments must intervene by affording wireless solutions to improve this social ill. Few studies, however, examine the relationship between the claims-making activities around such interventions, specifically in reference to closing the digital divide, and the perceptions of the actual impact of those initiatives on this divide. We bring together two data sets. The first dataset is from a previous study examining the public rhetoric surrounding these initiatives vis-à-vis the digital divide. The latter is part of a much larger study on the network's impact on the divide. We conclude that these networks are necessary but insufficient in bridging the gap.

Introduction

In the past several years a rift has opened between researchers who study the social context of wireless networks. The dividing issue seems to be the origin of the network. On the one side exist community wireless networks that originate in the hands of interested, concerned and technologically able citizen and community groups. On the opposing side exist municipal-sponsored or owned wireless networks, in which the city acts a convener, leader, provider and designer of the network. The first case is typically characterized as *bottom-up* or grassroots while the second is often presented as *top-down.* In several of the earliest case-studies, several of these networks were often framed as in conflict or opposed to the other form. We believe this dichotomy to be useful in describing the origins and establishment efforts of networks, but less useful as networks age and mature.

With the exponential growth of these networks in both quantity and size, we have seen a marked hybridization in which partnerships between local governments, industry and community groups define the ownership, management, maintenance and use of these networks (see Tapia and Ortiz 2006; 2007). They are not purely municipal, community nor private. Clement and Bryne-Potter call this hybrid *public broadband*, or broadband in the public interest, and define it as broadband networks that serve the public interest, regardless of the ideology upon which they were founded and the means by which they are provided (Bryne-Potter and Clement, 2007) Additionally supporting this hybridization is Meinrath's (2005) assertion that Community Wireless Networks are small and locally based, often comprised of non-profits, unincorporated, municipally supported, hybrid partnerships, usually

constructed from off the shelf hardware, action and results oriented and possessing a mission to support both social and economic development (Meinrath, 2005)

For the purposes of this paper we position the wireless networks in question as hybrids or complex partnerships, falling between the municipal and the community, with the expressed goal of engaging social issues within the community in question. The term we use throughout the paper is *municipal-community network*, to demonstrate this hybridization.

The goal of this paper is to examine wireless broadband in the form of municipal-community wireless networks, and their professed role in alleviating the digital divide. Regardless of the ownership of the network, communities have clearly stated the problem that broadband access to the Internet is commonly believed to be essential for all and yet is not available to all. The skills necessary to use information and communications technologies are not universally prevalent, yet are seen as becoming more centrally necessary to navigate everyday tasks. To address this digital divide, municipal communities are stepping in to offer wireless broadband Internet access (Ortiz and Tapia 2006; Tapia 2006; Tapia, Maldonado and Ortiz 2006; Tapia, Maitland and Stone 2005; Tapia, Maitland and Stone 2006; Tapia and Ortiz 2006)

In this paper we examine the most recent of these efforts, municipal-community wireless broadband networks. As of April 2007, nearly 400 cities in the United States have initiated, developed or deployed some form of wireless network with the intent of providing some form of Internet access to their populace. These initiatives have taken diverse forms, adopted many different business plans, and are at various stages of development. Despite these differences, they are similar in their commitment to four stated justifications for developing these networks: (1) provide low-cost alternatives for public safety and other institutional demands for wireless Internet, (2) promote economic development, (3) promote tourism, and (4) narrow the digital divide and promote social inclusion (see Ortiz and Tapia 2006 and Tapia and Ortiz 2006 for a full analysis of these policy justifications).

The way in which public officials discuss and document the goals of these municipal-community projects is our core interest. The public discussion and documentation of municipal-community wireless networks provide particular insights in understanding the public discourse on the digital divide, its complexities, its importance, its severity, and its solutions. The purpose of this study is to understand the intersection between the claims-making activities for two municipal-community wireless broadband initiatives (Portland, Oregon and Tempe, Arizona), specifically in reference to closing the digital divide, and the perceptions of the actual impact of those initiatives on this divide.

In order to answer this question, we bring together two datasets. The first dataset encompasses textual documents from twenty-four cities in the United States, which have used the claim that one of the central purposes of deploying a municipal-community wireless broadband network is to bridge the digital divide. The documents in question are websites, press releases, requests for proposals, letters of intent, and other official policy documents from each city collected and catalogued during 2005 and 2006. Using discourse analysis, these documents were then analyzed using a coding scheme which produced four themes in how these cities rhetorically viewed the concepts of the digital divide in the municipal-community wireless public discussions (for a complete analysis of this dataset see Tapia and Ortiz, forthcoming in 2007; in addition see Ortiz and Tapia 2006; Tapia, Maitland and Stone 2006; Tapia, Maldonado and Ortiz 2006; Stone, Maitland and Tapia, 2005; Tapia and Ortiz 2006 a and 2006b).

The second dataset is a set of in-depth, semi-structured qualitative interviews with key informants from two US municipal-communities. These two American cities were

chosen because they fit the criteria of having deployed a citywide wireless broadband network by 31 December 2006: they must have been in operation for public access; be government-led in some form; and have employed some form of public rhetoric linking project design, development, deployment and/or use to the digital divide and/or digital inclusion. These qualitative interviews are part of a much larger, multi-year study using both qualitative interviews and quantitative indicators of quality of life and universal service in these two cities assessing and measuring the impact of these municipal-community networks on the digital divide, both pre and post deployment.

The blending of these two datasets allows us to understand the relationship between the claims made by city officials as to the purposes of building these networks and the perceptions of local stakeholders as to whether there has been a measurable change that can be attributed to the deployment of the network.

The motivation for this study rests on the belief that the Internet is becoming a cornerstone of American life, since much of the public, private, educational, and economic lives of Americans has both online and offline components. As full participation in civic, commercial and social life is tied to Internet and computer literacy and access, high-speed access is becoming a necessity rather than a luxury. However, from the literature analyzing solutions to the digital divide, it is known that providing Internet access is not enough to solve the problem. It must be coupled in an ensemble of social and technical solutions.

Through the capturing of qualitative, perception data from each of these two cities, we anticipate documenting that municipal-community networks may be necessary but not sufficient, requiring cities to take more holistic approaches to closing the gap.

Several organizations have attempted to define community wireless network or networking. Most notable is the *Wireless Commons* which in their manifesto have listed several fundamental elements including; non-discriminatory routing, organic growth, mesh networking, distributed ownership, best effort, end-to-end connectivity, fully routable addresses, fault isolation, anonymous access, building use and generating content, and responsibility[1][1]. Another notable source is the *Community Wireless Infrastructure Research Project* which has identified the following items as necessary to community wireless projects; ubiquitous and universal, widely useful, usable, accessible, affordable, reliable, high quality, healthy, cost-effective, accountable & responsive, secure, privacy enabling, open, neutral & non-discriminatory[2][2].

The Municipal-Community Digital Divide

Information technology has become central to our knowledge economy and thus wedded to wealth, power, and prestige. There is a strong common belief that people who have access to and the skills to use the Internet are (1) more successful economically, with respect to education, jobs, earnings, (2) socially participate more in terms of political and civic engagement, (3) and receive more government services and other public goods than those who do not. (Katz and Rice 2002; Kennard 2001; Oden 2004; Oden and Strover 2002; Tufekcioglu 2003) “Immediate and asynchronous connectivity together with the diversity of information accessible via the computer can, furthermore, increase social inclusion and social position. (Oden 2004:5) Increased access to the Internet also provides greater access to education, income and other resources (Benton Foundation 1998; Bucy 2000; Hoffman and Thomas 1998, 1999; Strover 1999).

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[1] *http://www.wirelesscommons.org/definition*

[2] *http://www.cwirp.ca/*

The digital divide reflects ongoing social inequalities in the U.S., explained by both the lack of vision as well as entrenched social, economic and political systems (Bagasao, Macias, Jones and Pachon 1999). These systems of social inequality not only shape diffusion rates, but they also shape the use of IT in ways that reinforce existing inequalities rather than mitigate them (Kvasny and Trauth, 2002; Kvasny and Truex, 2001; Kvasny 2002; Kvasny, L. and Payton, 2005; Kvasny 2006; Kvasny and Keil 2006; DiMaggio 2001; Kling and Lamb 2000). Thus broad patterns of social inequality in education, work, consumption opportunities, and democratic participation are at the heart of the digital divide and continue to broaden the gap.

Moreover, while more individuals are gaining access to the Internet daily, the gap between the haves and have-nots is widening in terms of use, technical competence and information literacy. It is unclear whether this digital divide is caused by economic issues (e.g., cost of basic services), education, or social issues (e.g., perception of the use of the internet). If mere access to information services does not affect the digital divide (or even exacerbates the divide), then new understanding is required to assist policy development and cyber infrastructure implementation and dissemination. Without such an understanding, tax dollars can be wasted and well-intentioned investments in the national cyber infrastructure could actually exacerbate the digital divide.

In addition to persisting gaps in access to information and communication technologies, gaps in skills and usage may be a larger social problem. (DiMaggio and Hargittai 2002; Gordo 2000; Lazarus and Mora 2000; Oden and Strover 2002; Servon 2002; Van Dijk 2001; Warschauer 2003). These scholars have stressed the cultural, educational, political and socio-economic aspects of the digital divide and believe that while access is being addressed, many other gaps widen. From this point of view government and industry has focused too narrowly on addressing the access issue by providing devices to schools and communities. Since these policy makers have not defined the digital divide in terms of skills and competence, they have not invested in training, teaching and technical assistance that would better address the issues.

In response, Community Informatics (CI) was developed. CI is a rapidly growing and emerging multidisciplinary field that examines how information and communication technologies (ICTs) can effectively support a community's socio-economic, socio-political or socio-cultural objectives (Gurstein, 2000; Clement, 1981; Eglash, 2001b; Loader & Keeble, 2002). According to Stoecker, "[Community informatics is] a sustainable approach to community enrichment that integrates participatory design of information technology resources, popular education, and asset-based development to enhance citizen empowerment and quality of life" (Stoecker, 2005).

Community informatics is the term that has become especially widely known in recent years to describe the action-oriented approach for not only describing, but redressing the digital divide. Fundamental to CI is the notion of access to the technology; proponents argue that without it little can be achieved (Clement & Shade, 2000; Strath, 2001; Graham, 2005). Unlike much of the early digital divide literature, the overarching goal of CI is to provide more than just access to technology, but also develop key strategies for engaging local constituents in using the technologies for social, economic and political purposes (Gurstein, 2003; O'Neil, 2002; Warschauer, 2003, 2003b).

Moreover, this praxis-based approach attempts to link economic and social development efforts at the grassroots level with emerging opportunities in such areas as e-commerce, neighborhood computer portals, community and civic networks. It investigates an often complex and dynamic linkage between technological innovation and ever-changing

social relationships. This often requires structural and cultural changes in the organizations of local stakeholders in order to accomplish successful ICT community efforts.

In the age of the digital information economy, a focused CI agenda appears to be important for stimulating, maintaining, coordinating and interpreting inter- and intra-organizational relationships (Eglash, 2001b; Castells, 1996). From a municipal wireless broadband context, CI is the application and diffusion of broadband Internet services to the public through an IEEE 802.11x wireless platform for the achievement of community objectives. CI views the municipal broadband urban revival effort through a lens of opportunity to develop social capital rather than through a lens of crisis (Fernback, 2005). According to Graham (2005), a CI approach might include the development of multifarious radical strategies and techniques for socio-community analysis and reform, technology appropriation and planning, and outcomes assessment programs. Using this theoretical approach, CI recognizes the realities of community life by attempting to integrate them into the design, implementation and development of municipal broadband systems. This framework reveals tensions that exist between different social actors, namely public elites, incumbents, technologists, public strongholds, and community activists (Orlikowski & Barley, 2001; Stoecker, 2005; Gurstein, 2000, 2003).

The literature suggests that municipal-community wireless networks have the potential of offering inexpensive, high-speed, wireless broadband connections to neighborhood, local businesses and public institutions (Barranca, 2004; Garvey, 2002; Gillett, S. & Lehr, 1999; Gillett, S. e. a., 2003; Rao, 2003). Municipal-community wireless broadband networks can be defined as a government-community effort to design, develop, implement and employ wireless broadband services for a specific coverage area, for specific users and for a particular moment in time. As a public entity charged with providing high quality services for citizens, some governments feel compelled to act; providing readily available low-cost mesh networks is one way to act (Tapia et al., 2005). Essentially, governments and grassroots organizations are deploying wireless broadband for three reasons: to bridge the digital divide, enhance inter- and intra-governmental applications and promote local economic development.

Wireless networks operate with low-cost, easy-installation rooftop antennae and fast speeds. The argument is that as more users join the network, it becomes less expensive and more robust. Proponents urge policymakers to allow this technology to expand so that municipal-community networks can create next-generation media systems that serve all citizens. Specifically, they envision that these networks will achieve three objectives: municipal-community applications, economic development and digital equality (i.e. bridge the digital divide). They will provide disadvantaged schools with high-tech resources, as well as opportunities for adult education and distance learning (Meinrath, 2006; Rao, 2003); local grassroots groups, like churches, with the means to web-cast religious services and spiritual resources (Meinrath, 2006); local libraries with the ability to become community hubs for free, open access to information; and parks, swimming pools, beaches, sports facilities, airports, train stations, and other public access areas with the opportunity to benefit from communications and information services (Meinrath, 2006).

It is known that providing Internet access is not enough to solve the problem of digital inequality. It must become part of an ensemble of social and technical solutions. According to Ben Scott, Policy Director for the Free Press, "For meaningful digital inclusion to occur, the goal of the network should be universal, affordable access for all members of a community. To reach this goal means more than just building a network infrastructure; it means attaining goals of equipment distribution, technology training, and social services." (as quoted in Meinrath, 2006)

Methodologies

Data Set: Municipal-community Wireless Network and the Digital Divide in Aggregate

Since June 2005, we have created a dynamic and evolving database of all municipal-community wireless initiatives in the United States (see Ortiz and Tapia 2006; Tapia 2006; Tapia, Maldonado and Ortiz 2006; Tapia, Maitland and Stone 2005; Tapia, Maitland and Stone 2006; Tapia and Ortiz 2006). As of June 2007, we have a total of 357 entries. The data that we have collected spans multiple categories including information on the shape, form, uses, and technologies of the municipal-community network itself; the business plan and/or service delivery plan; the status of the development/deployment of the network; the social impacts of the network; and the marketing language used by the owners and users of the network.

This database has been populated through a variety of methodologies. In most cases, information was obtained through the use of the Internet, using crawling techniques via municipal-community sponsored websites, press releases, public documents and online news and web logs. In addition, when information proved scarce or dubious, municipal-community communities were called, and information was supplemented and verified through direct interview by telephone.

According to our database, as of June 2007, 166 municipal communities (approximately 46%) textually addressed either universal service, social inclusion or the digital divide in some way in their literature. All 357 municipal communities gave some form of economic development as their primary reason for deploying a MWN. Drawing from one subsection of fields from the database, we have compiled all texts from these cities. While the documents analyzed do not form a complete picture of the intent of the city or its representatives, as they are specific in time and space in the experiences of that city, they were read literally in terms of a discursive event. (For a complete presentation and analysis of this data see Tapia and Ortiz, forthcoming, 2007)

Data Set Two: Municipal-Community Wireless Networks Two Case Studies

Two US cities were selected for in-depth case studies, Portland, Oregon and Tempe, Arizona. A case study approach allows for a detailed exploration of a highly complex and multi-dimensional socio-political phenomenon. These two cities were chosen because they are attempting to address the digital divide by way of a citywide wireless broadband network. The cities selected for this study represent those with a deployed wireless broadband system and have been in operation for public access since 31 December 2006. These cities must have employed some form of public rhetoric linking project design, development, deployment or use to the digital divide. In other words, a city must have showed a municipal-community strategy that incorporates a variety of municipal-community resources, capacities, and powers to address at least one of the following: poverty reduction, increased social or political involvement, or improved quality of life for low-income residents.

Each case study is based on interviews with approximately 10 community leaders. Interviews lasted between 30 and 60 minutes. The semi-structured interviews were conducted with Council members, the city's Economic Development Director, City Manager (where appropriate), other key city staff, and non-municipal-community city partners. City partners differed in each city, but across all cities this group included Chamber of Commerce representatives, librarians, executive directors of nonprofit agencies, and neighborhood organization representatives.

Together, these two data sets help explain the complex and dynamic nature of both the digital divide and municipal-community wireless networks. To further probe this idea, this study considers one central research question, "To what extent are the digital divide claims-making activities around municipal-community wireless systems mirroring the perceptions of the actual impact of those initiatives on the divide? It appears that the data does not allow for a more direct question, i.e. looking at the 'actual impact' rather than 'perceptions of the actual impact'. Nevertheless, it is important to highlight that the indirect nature of this research will shed light on some of the daunting challenges faced by researchers who want to better understand the actual impact of the initiatives on the digital divide. Another larger, multi-year study will employ a variety of methodologies and examine the actual impact pre- and post-implementation. This study provides insights into making better use of wireless networks to bring connectivity and access to citizens and develops a framework to help municipalities and citizens within them better understand the complexities of the digital divide.

Findings: Aggregate

We have developed a typology based on our analysis of the texts addressing the digital divide associated with the 166 cities in our study. We have developed this four-fold typology to better discuss our results, and to demonstrate the relative frequencies of these themes occurring in the data. Below we list the four themes that emerged from the data. For each of the themes we provide one illustrative quote.

Theme One (Connectivity Divide): Ubiquitous connectivity creates an identity and revitalizes the community. This theme is the least direct of all four themes. This theme is based on a tenuous connection between city branding, economic development and a trickle-down effect of narrowing the digital divide by way of access. These municipal communities addressed the digital divide by seeing it as principally an economic problem to be solved through the support of mostly business and education/training. By providing stable, reliable, low cost and ubiquitous broadband access to local public and private institutions, economies would be stimulated and the causes of poverty would be lessened. Approximately 32 cities fell into this category.

Cabin John, MD "*The Cabin John Citizens Association is an organization of concerned citizens dedicated to addressing the concerns of the Cabin John community. The CJCA's fundamental goal is to preserve and promote the identity of Cabin John as a community.*[3]"

Theme Two (Content/Utility Divide): Internet access is seen as a utility and thus the City's responsibility towards citizens. This theme draws on two central concepts, the Internet as a utility and as a responsibility. These cities addressed the digital divide indirectly, stating that it was the government's responsibility to provide for education, training, as well as civic and economic opportunities for its citizens. Addressing these, would in turn narrow the digital divide. The proposed network would support the City's services. This theme was noted in approximately 14 cities.

Chicago, IL "*Chicago's CivicNet is an initiative of the City of Chicago and the Mayor's Council of Technology Advisors to create the new infrastructure Chicago needs to compete for jobs, to improve education, to train the Internet work force, and to eliminate digital divide. Chicago is taking steps that are appropriate for a government - such as*

[3] http://www.muniwireless.com/reports/docs/CabinJohnRFI.pdf

building roads and highways and water and sewer systems. To compete in the Internet age, a whole new infrastructure is needed - one that can carry high speed communications."[4]

Theme Three (Capability/Usage Divide): Ubiquitous wireless broadband will increase accessibility and usage. This theme is based on two fundamental beliefs, (1) citizens who do not use the Internet do not do so because they do not have access, and (2) providing access to these citizens will increase Internet usage. Approximately 43 municipal communities made a textual connection between increased access and increased usage.

> Sandoval County, NM "*One of the main reasons for building the county system is to bring rural residents high speed Internet access, Mann said. Many people in the state's rural areas do not have access to high-speed Internet service, which is particularly helpful for students and business owners.*[5]*"*

Theme Four (Context/Socio-economic Divide): Providing low-cost access to low-income areas translates into increased social benefits. These cities claim that by providing Internet access they will create economic, educational and social opportunities for those traditionally excluded from such opportunities. This theme was the most prevalent. Approximately 94 municipal-community communities had some language referring to the social benefits of wider Internet access.

> San Francisco, CA *"As the United States lags behind other nations in equipping our citizens for the global economy. San Francisco understands that universal, affordable, wireless broadband access is essential to boost our economic, social and educational opportunities. Providing universal, affordable, wireless broadband access is just the first phase of our new TechConnect strategy that will bring the promise of technology to low income and disadvantaged citizens."*[6]

These four themes comprise, in part, the digital divide public rhetoric surrounding municipal-community wireless deployment.

Findings: Case Studies

We used the four themes developed from our aggregate database as a launch point for the analysis of our case study data. For each of the two cities listed below we provide some illustrative quotes to give a sense of the rich data collected via interviews. In addition, we categorize the data in terms of our four themes listed above. The intention is to demonstrate the echoes of the four themes drawn from public rhetoric in the voices of city representatives and local stakeholders. By doing so, we are able to show limited evidence of the connection between the public rhetoric and the actual impact of the broadband initiative in relation to the digital divide.

Portland, Oregon

Portland is a city at the confluence of the Willamette and Columbia rivers in the U.S. state of Oregon.[7] With a 2005 population of 514,000 it is Oregon's largest city, and the third largest in the Pacific Northwest, after Seattle, Washington and Vancouver, British Columbia.

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[4] *http://www.cityofchicago.org/civicnet/RFQInformation.html*

[5] *http://www.freenewmexican.com/news/34454.html*

[6] *http://www.govtech.net/digitalcommunities/story.php?id=96864*

[7] *See* *http://www.wikipedia.org*

Approximately 2 million live in the surrounding metropolitan area, the 24th-largest in the U.S.[8][8]

The municipal-community wireless project in Portland ('UnWire Portland') is a public-private partnership to bring citywide broadband internet access to the city. The project manager works with their selected vendor ('MetroFi') who provides them with information and guidance about various city policies and liaises with residents, media representatives, businesses and other organizations. MetroFi provides wireless access to Portland residents. MetroFi offers consumer users two models: for $19.95, users can get speeds of 1Mbps with a 256Kbps upload channel without advertising; or they can get a free version of the service by accepting advertising. Since its December 2006 launch, the provider announced that its network had registered 19,900 users.[9]

Portland was chosen as a case study for this research because they have stated explicitly that they are attempting to address the digital divide by way of a citywide wireless broadband network.[10] Below are examples of the public rhetoric drawn from our aggregate database.

> "*MetroFi has demonstrated its commitment to bridging the digital divide by offering both free and low-cost alternatives for broadband access on an open provider network."*[11]

> "*Backers of a proposed citywide wireless Internet system claim that its lower-priced service will help close the 'digital divide' -- the gap in Internet access between White and non-White households. But if a Portland-based company has its way, the digital divide could close even faster."*[12]

Despite aiming to bridge the digital divide in the community, the UnWire Portland project fails to connect all groups (including marginalized communities) to the wireless cloud. Compared to the general population, only a small fraction of citizens have connected to the city-wide Wi-Fi grid[13], and those who connected were mainly students, knowledge workers and downtown residents who were already experienced in the use of Internet access and computer usage. Disadvantaged communities, the elderly, the unemployed and the computer-illiterate were largely excluded from the wireless network. The government-led initiative failed to expand overall utilization and to extend their definition of the digital divide to go beyond simple access. The result being that, in this instance, those who took up the offer of Wi-Fi access were much more likely to be among the more privileged members of Portland rather than those who remained on the negative side of the divide.

The UnWire Portland program has been unable to craft a sound digital inclusion policy vis-à-vis the wireless broadband project. It appears that Portland sought to address the digital divide indirectly, to provide low-cost internet access to users who already have access to the Internet which in turn would not address at least one of the following: poverty reduction, increased social or political involvement by marginalized communities, or

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[8] *Ibid*

[9] *See http://www.metrofi.com*

[10] *Portland also met the criteria in that its network had been in operation for public access since 31 December 2006.*

[11] *PR Newswire US - April 12, 2006, http://www.prnewswire.com*

[12] *Portland Skanner - October 26, 2005, http://www.highbeam.com/doc/1P1-117239572.html*

[13] *Most of these users are located in the downtown core (about 16,000 users by mid-2007 out of approximately 500,000 residents) and it's still a mystery whether these 16,000 users are those who were previously unconnected.*

improved quality of life for residents of low-income profiles. There is certainly an interesting point here, that despite recognizing the value of a municipal-community network for closing the digital divide, Portland opted not to go in this direction. A city informant stated:

> "*One of the things here in the city is that we recognize there are several aspects of the digital divide. We understand this project is not designed to solve all of those aspects. This project can solve issues related to the availability of high-speed Internet access, and the monthly cost. It cannot solve the relevance of Internet access. We did not lump all those issues in the UnWire Portland project."* (Interview subject # 013080)

According to another subject, the city had previously considered a digital inclusion proposal in conjunction with One Word Oregon (a progressive news-reporting agency with over 10,000 members across the state). The policy document was supported by local commissioners but the city chose not to approve it in spite of having the largest positive response in that budget cycle. In this proposal, the digital divide was framed as a social problem that was caused, in part, by inequities in the ability to access and to use ICT. Using this as a starting point, the proposal focused on providing appropriate parenting support from public elites (e.g. emphasizing the educational importance of having home access). To this participant (see quote above), the MetroFi-UnWirePortland partnership was used as an excuse and allowed the city to say to the media, their citizens, policy makers, and ILECs that they were addressing digital inclusion issues by using a public-private partnership model. It is important to highlight that their model, in fact, has only been successful in providing low-cost access to their downtown core users. The result is to afford them the opportunity of "checking it off" their list and moving on to other areas of interest, without actually having addressed the more fundamental issue of how the ICT was used in the home as per the One Word Oregon proposal.

Several city informants felt that the city had placed less of an emphasis on solving the digital divide issue and more emphasis on the hype surrounding the network. One senior executive from a local economic development agency said,

> "*It's a fad in government because it's something to check off their list. I think people are fundamentally opportunists. The reality and the problem that I see from rural to inner city communities is that those kids who qualify for free or reduced lunch are those kids who are least likely to have a computer or internet access at home. Our economy is hemorrhaging manufacturing jobs. 8 out 10 jobs require technology skills. I don't think the city has failed, I don't think it has tried."* (Subject # 013085)

Several participants outside of city hall suggested that they ultimately did not understand the City's purpose in building the network and had significant doubts as to how it would narrow the digital divide. One community advocate described reluctance on the part of the city to fund digital divide or digital inclusion efforts.

> "*We haven't found the Portland's MetroFi solution to be very workable. Despite efforts that I would applaud that I would place the receiver near low-income buildings, there is very little penetration into the building. The way it's setup is very hard to repeat that signal from MetroFi to inside buildings. I have a concern, does the free model create a perception that it's there? We're actually worst off than when we started."* (Subject # 013086)

A city official from the Office of Management and Finance stated,

> "*We are beginning to realize it's more than access. In 2003-2004, we conducted a study where we gave people computers and a low cost Internet connection and they didn't use those computers to interact with government. It was really interesting to us. Sometimes what people use technology for sometimes it has nothing to do with what governments do. There is a difference with providing people the tools and with providing content that's relevant to them."* (Subject # 013079)

A digital inclusion expert stated,

> "*From a digital inclusion side, the city has got to a) put up some money of its own to help people get computers. More than 10,000 kids in Portland schools don't have a computer at home. Something has got to be done to get computers into their hands. b) there needs to be a real focus on the training and the city needs to show how people will use the web to access government services. When you are dealing with people that are poor, you have to think about literacy issues with low or no literacy, If you look at the City of Portland's website right now, not only does it not provide any real information to people with little or no literacy, you need a Masters degree to navigate the site…Categorically-speaking, I don't see the city pursuing any partnerships to ensure the success of the network. It actually refuses to engage in any kind of collaborative process. It's just not a priority."* (Subject # 013085)

This speaker is critiquing the city of Portland's efforts as not more directly addressing the digital divide, despite the city's clear statements that it is not intending to address them, in part.

From this data we see Portland overall reflecting *Theme Four*, stating they are aware of the potential socio-economic benefits model, but choose not to follow it. This recognition may provide insight as to why training, technology transfer programs, and forums stimulated by the UnWire Portland project were scarce in the city.

In terms of the digital divide, Portland seems to have created some cognitive dissonance[14][14] for itself in that it states that the problem of the digital divide is important, that providing access alone is not enough to solve it, yet they clearly act as if access alone is sufficient and state openly that the goals of the municipal network are not to bridge the digital divide directly, despite earlier claims to do so. Clearly, the city appears to be suffering from an uncomfortable tension between two conflicting desires: should they only provide access or should they be providing more than simple access? Overall, this observation offers us insight as to how cities like Portland are beginning to respond to community needs.

Tempe, Arizona

Tempe**,** a city in Maricopa County, AZ is a major suburb located immediately southeast of Phoenix. It is the most densely-populated city in AZ and, according to 2005 Census Bureau, is estimated to have a population of 161,143.[15][15] The city officially launched the network at the end of March 2006 from border to border within Tempe.[16][16]

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[14] *Cognitive dissonance is a psychological phenomenon that occurs when there is a discrepancy (i.e. dissonance) between what someone believes, knows and values, and persuasive information that calls these ideas into question.*

[15] *See http://www.wikipedia.org*

[16] *Tempe also met our criteria in that its network had been in operation for public access since 31 December 2006.*

Tempe's story highlights the economic attraction of municipal-community wireless projects. Another analogous theme that appears to resonate throughout the Tempe case study is their essentialist goal of providing universal wireless broadband access to residents. As a case in point, Tempe became the first major US metropolitan area to deploy citywide WiFi access thereby affording users a border-to-border network coverage grid. For both government officials and local stakeholders interviewed the high-speed project is a powerful weapon in fighting digital exclusion and a developer of community identity and participation.

Tempe was chosen as a case study for this research because they have stated openly that they are attempting to provide low-cost internet access leading to continued economic development, which in turn may address at least one of the following: poverty reduction, increased social or political involvement, or improved quality of life for low residents. While much of the literature does not use the term "digital divide" the city makes the case for their network by stating that its deployment will bring economic benefits to all sectors and all strata of Tempe's population. It is important to note that the lack of explicit 'digital divide' rhetoric in Tempe's texts makes it difficult to decipher the city's digital inclusion goals. Nonetheless, below are examples of the public rhetoric drawn from our aggregate database:

> "*Tempe is truly blazing the trail with border-to-border wireless Internet access. Those who live, work and play in Tempe are the beneficiaries of this technology."*[17]

> "*{The City of Tempe plans]…to expand the wireless infrastructure to the entire city through an open RFP process. This project will make affordable, high-quality, uninterrupted broadband wireless service available to all residents and businesses in Tempe. "*

> "*The Introduction of Wireless Broadband in Tempe brings needed competition to cable, DSL, and satellite Internet services. It provides free access to educational (ASU.EDU) and City services (Tempe.GOV) to residents of Tempe that may not be able to afford or wish to pay monthly access fees."*[18]

Most of these views were echoed by city representatives. A city official from the Development Services Department stated,

> "*I can tell you without a doubt that we have buildings and companies here because we have a lake in the north end of our town. There is a direct correlation because I have contracts, documents, private-public partnerships agreements where we have investors paying money to keep the lake there. But I don't have a contract that says [the provider] will move here and spend X amount of money to keep the network running. I couldn't tell you that. The wireless network is more ephemeral and so few people use it. The network helps but by no means closes the digital divide."* (Subject # 012982)

Similarly, the link between the financial and digital divides was also made explicit by one respondent, for example:

> "*The key to financial status is access to and comfort with education, and information that helps you lift yourself out of your current condition. The digital divide is creating, fostering and supporting the financial divide and is the most problematic in*

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[17] *Mayor Hugh Hallman, The Arizona Republic – April 29, 2005*
http://www.azcentral.com/arizonarepublic/mesa/articles/0429t-wifiZ11.html

[18] *http://Tempe.gov*

the future, especially for the younger generation. The city thinks they know about it but don't feel it as deeply. They feel it is about being cutting-edge and it's about the "smart place to be" – that's our tagline. It used to be "the best place to live, work and play". Smart communities are forward thinking by having this kind of amenity in their community." (Subject # 012979)

A key theme relating to the implementation of the network and digital divide issues is the role of marketing and communications. This seems to be a good example of *Theme Four* (Context/Socio-economic Divide: Providing low-cost access to low-income areas translates into increased social benefits). Socio-economic development closes the gap.

One respondent responsible for information dissemination for the public school district emphasized that the network might not be necessarily enhancing quality of life factors, but certainly made people think the city is progressing and ahead of other cities by becoming pioneers. She attributed the city's somewhat exaggerated approach to their communications team. She articulated her view as follows:

"*Hard to say it has an impact on the community at large. I know it's definitely being marketed as another great feature of this town. I deal with a lot of the city's marketing and communications people and they've had very interesting and successful campaigns both publicity in local media and marketing that have made the system look positive. They've done a good job by letting people know it's available…"* (Subject # 012985)

In the same way, there remains a strong public sector ethos, which, as one respondent stated, can cause problems in that government elites inevitably lack the right training to tackle the complex nature of the digital divide:

"*What we found is not so much the tool that you give the children, but how you're using the tool. If every child has wireless Internet, are they using it to access games or comprehension skills based programs? Do I think it has potential to help with literacy? Absolutely. But it has to be used in a highly complex, really smart way. It doesn't just happen because you give them the tool."* (Subject # 012986)

Here we see some elements of both *Theme Three*: (Capability/Usage Divide) Ubiquitous wireless broadband will increase accessibility and usage, and *Theme Four*: (Context/Socio-economic Divide). However, the strong sentiment coming from the interviews from Tempe suggested the nearly universal support for a socio-economic development view of closing the digital divide (*Theme Four*). The implications of this observation prompt a reconsideration of official digital divide policy in this area. It suggests a shift away from a digital model that is characterized by connectivity alone and towards a model that involves capability/usage, socio-cultural, socio-political, and socio-economic complexities and processes. To achieve the goal of universal access to broadband services for all Tempeans, the city needs a more holistic approach that includes an understanding of both the capability/usage divide as well as the context/socio-economic divide..

Analysis and Discussion

Affordable access to broadband is increasingly important and becoming a prerequisite for participating in the new digital global economy. Yet broadband diffusion and adoption in the US lags many other industrialized nations. Over 450 US cities have responded to this problem by offering residents free or low cost wireless broadband access. Drawing from our aggregate database, we have learned that roughly one third of these cities have used the cause

of narrowing the digital divide, or improving the quality of life for all citizens, as a reason for their action.

From this group, which has made this direct link between municipal Internet programs and improved living conditions for all citizens, we have distilled these claims to four themes. What all four themes have in common is that the language used by all these municipalities to promote and describe the potential future impacts of their municipal-community network is strongly deterministic in nature. Technological change is viewed as both a necessary and a sufficient condition determining all other social change. It is in this light that each of the four themes states that by adding a municipal-community sponsored wireless network and granting Internet access to their citizens, several things will happen including greater usage of the Internet, increased economic development and more job opportunities for the disenfranchised, more education and training opportunities, and improved social conditions for users. All point to a direct connection between wireless Internet access and the closing of the digital divide.

It most be noted that while technological determinism can be applicable and useful in situations that are characterized by high degrees of control and short time frames, it has limited value in dynamic and complex situations that unfold over longer periods of time. Technological determinism cannot adequately account for the interactions between technologies; the people who design, implement and use them; and the social and organizational contexts in which the technologies and people are embedded. The language used by these municipal communities implies a simplistic, direct-effect view of solving the problem of the digital divide, which will undoubtedly fail.

In the case of Portland, the city has clearly stated that the municipal-sponsored network will help bridge the digital divide. In the case of Tempe, the city has clearly stated that the municipal-sponsored network will raise the quality of life for all Tempe citizens.

What is perhaps most interesting here is the comparison between what is found in this direct-effects rhetoric used by the cities in question, and the experience of the network by both city employees and municipal-community key informants in these cities. In both cases there was a clear disconnect between the stated intentions of the network and the perceived effects of the network.

As perceived by the key informants in Portland, despite earlier claims that the link between a successful and universal Internet network and a narrower digital divide would be strong and causal, they have found the city's actions actually distancing itself from the digital divide phenomenon. City employee informants claimed that bridging the digital divide was not even a goal for the network any longer. Community informants also supported this claim and struggled to understand why the city had not engaged in a more comprehensive, direct and holistic effort to narrow the divide. It was generally perceived that the city had backed away from its earlier claims of what the network might accomplish, leaving segments of their community well-connected but bewildered. In essence, Portland recognized the complexity of attempting to engage the digital divide post-implementation and shortly thereafter quickly asserted their project was not designed to solve all issues of the digital divide, just those related to the availability and cost of high-speed Internet access. Citizens, in turn, felt frustrated and abandoned by the city.

This said, Portland takes an interesting path toward addressing the digital divide in that they state its importance, recognize the role community can play, and do nothing publicly to foster it. This is a strange example of *Theme Four*: (Context/Socio-economic Divide). In the case of Portland, the city candidly admitted (post-implementation) that the goal of the UnWire Portland project is not to tackle the digital divide. However, Portland recognized that

the network did resolve matters related to access and cost. Paradoxically of course, connectivity and pricing are key components in tackling the digital divide. *Theme Four* was confirmed via a number of remarks by public officials about the way the business model might transform the nature of access/cost to something more. The most salient access/cost transformation was the idea that a free, ad-supported model might increase access and improve the social fabric of the community. The verdict is still out on whether any of these business models are economically sustainable.

Drawing from the rhetoric as stated by the city of Tempe, the digital divide will be eliminated by economic means, in other words by using low cost ubiquitous wireless Internet access as a marketing tool to draw in more business and jobs, leading to a higher standard of living for all citizens. However, key informants in Tempe believed that while the city is providing low cost Internet access throughout the city, most city officials and community representatives did not see any causal link between the broadband project and improving the quality of life for all citizens, especially the most impoverished.

In terms of access alone, while the network does indeed cover the entire city, because of its nature of the technology, it does not penetrate buildings, thus making the network a purely outdoor service. This implies mobility, which in turn implies laptop access rather than desktop access. For Tempe citizens of the lower socio-economic ranks this adds an additional financial burden in that laptops are typically more expensive than desktops and if they should want the service indoors it would only be possible with the additional purchase of a signal booster. In addition, the city of Tempe makes its wireless access free in the downtown areas near the university, but charges in all other areas of the city. While this may benefit the university, faculty and students, those citizens of Tempe who are not affiliated with the university and do not live downtown including the most socio-economically disadvantaged, are not receiving free service. In this light, the municipal network may actually be widening the gap between the digital haves and have-nots.

Tempe has made the digital divide issue a purely economic issue in which the intentions of the network are to help brand the city, attract new business, and eventually provide more jobs. This, along with access, will eventually bridge the digital divide. This is best seen through our *Theme One*: (Connectivity Divide). As with other elements of the discussion, the participants did not agree whether the network would help or hurt the social fabric of their community. Several participants noted that the lack of policy that addresses the digital divide directly would eventually produce stagnation in the evolution of the network and other government-led technological initiatives. This issue of "playing down" the policy implications and oversimplifying a complex reality might result in wasted resources and false expectations.

In both cases, the intention of these cities was to provide low cost, ubiquitous Internet access. Both believed that Internet access played a role in improving the quality of life for all citizens, including those socially, economically, and digitally disadvantaged. For Portland, their broadband network was rhetorically framed in terms of access alone, For most academicians and researchers, Internet access is a necessary but not a sufficient condition for closing the digital divide. For Tempe, providing Internet access was rhetorically framed as what was needed to prime the economic pump to start the economic engine, leading to a higher quality of life for all citizens. While this rhetoric and access may indeed bring new businesses and jobs to Tempe, the current form of access it offers does little for current disadvantaged citizens.

Conclusions

We find that delivering broadband Internet access to disenfranchised neighborhoods or institutions does not, in fact, narrow the gap. In other words, merely adding low-cost broadband Internet access to impoverished neighborhoods, without additional educational programs and low-cost devices, will exacerbate the divide. Recent research (see Kvasny and Payton, 2005; Kvasny 2006; Kvasny and Keil 2006; DiMaggio 2001; Kling and Lamb 2000) suggest that the success of digital divide projects depends on a variety of factors such as training, education, user perceptions of IT, and the organization's past experience with using IT. In impoverished neighborhoods in cities in which municipalities offer wireless broadband, access may be interpreted as just another "out of reach" commodity. Without low-cost devices, appropriate cultural content and significant training and support, access may be simultaneously interpreted as useless (ie. Bicycles for fish) and yet another thing made for the rich, the White, and the elite.

The rhetoric surrounding these projects is that of hope, equity, and a better quality of life for all. However, the closer examination in this study of what city officials, local groups, citizens and the providers are actually experiencing suggests a flaw in this rhetoric. By and large, what emerges from these discussions is an optimistic view of the benefits to be harnessed from these networks for ameliorating the digital divide. This study posits that governments have been "blinded"' by the novelty of broadband technology; and the qualitative evidence suggests the projects examined do not live up to the proclaimed ideal of progress. To conceptualize technological change outside of any socio-political, socio-historical, or socio-economic context causes the technology, in this case access to wireless broadband, to appear to be an autonomous agent operating and having a direct effect on the digital divide outside of its relationship to other and societal processes.

Rhetoric that promises solutions to communities and does not deliver can actually cause additional problems. Most directly, cities waste money, time and effort on failed initiatives. More importantly, the gap between the digital haves and have-nots continues and grows. Additionally, community groups, partners and the public grow disillusioned with an associated increase in the the distrust of public officials and government. Lastly, the belief that technology directly solves social problems continues uncontested, even though it is so evidently failing again and again.

For some municipalities in which the promises of bridging the digital divide were especially clear and strong, and in which taxpayer dollars were used to fund the project, disconnects such as these can lead to a further mistrust of authority and technology, worsening the socio-cultural problems at the root of the digital divide. It other words, it will entrench existing exclusion, and educational and social inequality may increase. From our data we do not conclude that these municipal community projects are a failure and should not be attempted. We conclude rather that they have great potential but that the plans and actions taken by the government should match the rhetoric used by the public leaders. Plans should include the community and provide the auxiliary training and support necessary to build users instead of networks. Mismatched plans and rhetorical promises may do more harm than good.

In many ways this is a new frontier for research in this social-political-technological realm. Although there is research that suggests municipal-community networks in fact enhance economic development activity (Lehr, et al 2005), there is no academic research supporting the claim that they also address the digital divide. Little research has been conducted which examines the role of rhetoric, such as digital divide context, in planning and implementing these initiatives in the U.S. If the digital divide is socio-historical, socio-political, and socio-cultural in nature, and can only be dismantled through movements that address it on those levels, it is virtually impossible for cities to expect these networks will single-handedly address these problems.

In terms of the perceptions of the impact of city-sponsored municipal wireless network in Portland and Tempe, there is a perceived disconnect between the rhetoric used by the two cities involved in this study and the experience and expectations of those living and working within the city. These cities have made public claims that their networks will improve the quality of the lives of its citizens, either through the act of directly providing access in Portland, or through using that access to attract business and jobs to the community. In both cases the experience of those concerned with each project, including city employees, technical managers, community representatives, among others, found that while access was provided, it did little to improve the lives of the most disenfranchised citizens.

In both of the case studies presented here, the municipal wireless network was created as a top down, municipal-driven project, rather than a more community driven grassroots driven project. It is in this light that community informatics may play its greatest role. In this light since the latter part of 2006 the concept of digital inclusion has become a common term associated with large cities in the US and their wireless programs. Greg Richardson, managing partner at Civitium, a leading municipal consulting company, states that digital inclusion programs will bring technology products, services, training and content to lower-income or disadvantaged areas of the community. These digital inclusion programs may help bridge the gap between hopeful rhetoric and actual impact on the digital divide, principally by broadening the scope of digital divide to include the social and to include multiple community players within the design and deployment space.

According to Ben Scott, Policy Director for the Free Press, "For meaningful digital inclusion to occur, the goal of the network should be universal, affordable access for all members of a community. To reach this goal means more than just building a network infrastructure; it means attaining goals of equipment distribution, technology training, and social services"(as quoted in Meinrath, 2006). In 2006, several cities have moved from discussing Municipal Wireless projects and their impact on the digital divide to creating digital inclusion programs that include more than access alone.

Whether or not these Wi-Fi portals will serve as a medium that will push us further into the new digital global economy discussed by countless authors remains a murky issue. In some ways, these Mu-Fi systems fit well in that they do provide basic access to the experienced. Conversely, it does not serve as a medium that allows universal service for all, especially at-risk communities. Just as with other telecommunication services, Internet access cannot be made available only to certain geographical areas of a city if its decision-makers truly intend to address the digital divide. It requires that the wireless cloud be made available everywhere and it requires that end-users (experienced or novice) have adequate training, resources, tools, services, and so on, to access and navigate the network.

However, it is possible that municipal-community Internet efforts to bridge the digital divide reflect a rhetorical strategy needed to sway taxpayers toward a more favorable stance. Social inclusion rhetoric may be increasingly important, especially in the light of continued state and federal legislation that threatens continued involvement in this area by municipal governments. We concede that the growing use of such language has brought the social inclusion issue to the forefront of many large municipalities, demanding much needed socio-political attention.

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