

The Bumpy Road to Universal Access: An Actor-Network Analysis of a US Municipal Broadband Internet Initiative

ABSTRACT

Universal high-speed Internet access can productively transform a nation's economy. However, many municipalities in the U.S. have been left behind in terms of Internet penetration. Some municipal governments have tried to address this by launching initiatives that aim at offering citywide, universal broadband access. Unfortunately, most of these initiatives have either been discontinued or have ended in failure. Drawing on actor-network theory, we conducted a three-year study to investigate the evolution of the Internet TV initiative in LaGrange, Georgia, U.S. The results reveal distinct interpretations of the initiative by different actor groups (the government, the service providers, socioeconomically advantaged residents, and socioeconomically disadvantaged residents), at different stages of implementation, pointing to tensions among the various groups. These tensions reflect the structural problems embedded in the macro political, economic, and societal context. The findings offer insights for policymakers who intend to achieve universal broadband access.

KEYWORDS

Digital Divide, Digital Inclusion, ICT Policy, Internet TV (iTV), Actor-Network Theory

INTRODUCTION

On February 22, 1965, President Eisenhower addressed the U.S. Congress and said:

Our unity as a nation is sustained by free communication of thought and by easy transportation of people and goods. The ceaseless flow of information throughout the Republic is matched by individual and commercial movement over a vast system of interconnected highways crisscrossing the country and joining at our national borders with friendly neighbors to the north and south.

Together, the united forces of our communication and transportation systems are dynamic elements in the very name we bear—United States. Without them, we would be a mere alliance of many separate parts¹.

Eisenhower's vision ultimately led to the Federal-Aid Highway Act and the creation of the Interstate highway system that profoundly transformed the U.S. economy (Foster 1992). The Interstate highway system is an example of a collectively-funded initiative in which 90% of the funding came from federal government and the remaining 10% from state and local governments (Hanson and Giuliano 2004).

Just as the Interstate highway system was a key infrastructure investment, universal high-speed Internet access may be essential for economic growth and could add \$500 billion to the U.S. economy (Lowry 2007). In 2004, then President George W. Bush declared that high-speed Internet access should reach "every corner" of the U.S. by 2007. Although the Bush administration clearly saw the benefits of universal broadband access, their plan for how to

¹ The Man Who Changed America, Part I by Richard F. Weingroff, March/April 2003, accessed at: <http://www.fhwa.dot.gov/infrastructure/history.htm>.

achieve this involved “the introduction of low taxes, more available spectrum and limited regulation as the way to encourage private companies” to bring high-speed Internet to the household (McCullagh 2004). The Bush administration’s vision, which emphasized free enterprise over government intervention, was very different from the collectively-funded approach taken by the Eisenhower administration with respect to the interstate highway system.

Unfortunately, even though the deadline set by the Bush administration has long since come and gone, the broadband penetration rate in the U.S. is nowhere near being universal (Lowry 2007). Whether couched in terms of physical access or in terms of household adoption rates, the U.S. is not in a leadership position with respect to broadband. Small and isolated municipalities, which are viewed as less economically valuable (Castells 1997b), have been left behind large metropolitan areas in terms of access (Kim et al. 2006; Townsend 2001). Undoubtedly, there will continue to be debates about the extent to which governments should or should not intervene to provide access or to encourage adoption (Spar 1999; Sy 1999). It has become widely recognized that some form of governmental intervention is required in order to reach the goal of equal access to information and communication technologies (ICT) (Graham and Marvin 2001; Sy 1999; Warschauer 2004).

In this study, we examined a specific case in which government intervention was applied to bring high-speed Internet access to the citizens of a small municipality. We use this case to illustrate the challenges of addressing digital inequality through government intervention that strives to provide universal high-speed Internet access to residents. In this way, the case serves as a microcosm for exploring broader public policy issues associated with addressing the problem of digital inequality.

Specifically, we use the actor-network theory (ANT) lens to investigate the municipal broadband

Internet initiative in the city of LaGrange, Georgia. The Lagrange Internet TV (LITV) initiative received widespread media attention as it was one of the first cases in which a municipal government supplied high-speed household Internet access to all citizens who wanted it (Meader et al. 2001). We analyze the case over a three-year period, from its inception through termination.² Governmental interventions are subject to the influence of the broader social, political, and economic contexts in which an ICT is to be implemented (Castells 2004; Musa et al. 2006; Musa et al. 2005; Sy 1999). Hence, scholars have emphasized the importance of incorporating contextual factors *a priori* into investigations such as the present one in order to reveal critical insights with regard to the success or failure of human interventions (Carter et al. 1999; Howcroft et al. 2004; Johns 2006). Hence, we draw on ANT and incorporate such surrounding factors as political context, economic environment, and societal structure to better understand why LITV succeeded for a time but was ultimately canceled.

Our focus on one municipality's efforts to provide municipal universal broadband access, and the broader lessons for public policy that can be drawn from their experience, is in line with the call for ICT scholars to emphasize issues of public interest (Hong and Tam 2006; Lytras 2005). The importance of researching policy issues with broad societal ramifications cannot be overstated (Rynes and Shapiro 2005). Given that governments around the world have expressed support for the concept of universal broadband access, it is crucial that researchers generate the kind of knowledge that will help policymakers to achieve this lofty goal. In this study, we seek to: (1) advance our theoretical understanding, through the ANT lens, of the challenges associated with

² This study is the third to be based on a large-scale research project on a governmental universal broadband intervention. The first evaluated differences in post-implementation behavioral models across socioeconomic status (Hsieh et al. 2008). The second evaluated how the socioeconomically advantaged (SEA) and the socioeconomically disadvantaged (SED) differ in the forms of capital for using ICT, and how these forms of capital are *relatively* impacted for the SEA and the SED through public policy for ICT access (Hsieh et al. forthcoming). These three studies differ in their research questions, theoretical foundation, and scope of data used, and contribute to different aspects of our understanding of the universal broadband issue.

implementing universal broadband access policies, and (2) contribute to the knowledgebase needed to guide the development of sound public ICT policies.

BACKGROUND

Governmental Universal Internet Initiatives

In theory, the Internet can be made available to everyone, yet in reality it is not (Sy 1999). When subject to an imperfect distribution mechanism, it is not equally accessible to everyone. This is particularly problematic in capitalistic, market-driven economies (Sinha 1991). Some commentators have thus warned that privatization of the telecom industry may not always be the optimal solution and can further marginalize individuals, areas, and nations that are disadvantaged (Sinha 1991; Sy 1999; Wellenius and Stern 1994). Hence, scholars have argued that governmental intervention is needed to ensure universal Internet access (Graham and Marvin 2001; Sy 1999; Warschauer 2004). The growing number of municipal Internet initiatives (Hu and Reardon 2005; Reardon 2005) demonstrates an understandable and logical move toward achieving universal access.

While universal services in general can bring about profound societal benefits, they require significant resources and cannot often be supported independently by any single (federal, state, or local) government, company or group of individuals. Hence, many collectively-funded initiatives have been launched to provide such universal services as health care (Pauly 1995, Kankaanpaa 2010, Driver and Martell 2006), housing (Driver and Martell 2006, Sound Families Initiative Steering Committee 2008), research and education (Zvereva et al. 2010, Roy 2001), social security (Kankaanpaa 2010), and energy (Paulauskas 2008). Thus, governmental universal broadband initiatives (such as municipal wifi (Tapia and Ortiz 2010) and Internet TV (Meaders et al. 2001)) usually take the form of collectively-funded projects that pool resources

from multiple stakeholders (e.g., state government, city government, private organizations, non-profit organizations, etc) (e.g., Meader et al. 2001; Tapia and Ortiz 2010; Hudson 2010).

These universal broadband initiatives usually aim to achieve objectives like universal access, social inclusion, civic engagement, public participation, and economic development (Hudson 2010; Meader et al. 2001; Tapia and Ortiz 2010; Tapia et al. 2011). [Unfortunately, most of these initiatives have faced serious challenges and, as a result, have ended up being terminated \(Wu 2007, Tapia and Ortiz 2010; Hudson 2010\).](#) Prior work has pointed to a variety of reasons why such projects have failed. For instance, some studies have shown that the initiators and supporters of these projects have tended to assume a naive technological deterministic view, believing that objectives ranging from social inclusion to economic development can be attained merely by providing low cost or free Internet access to citizens (e.g., Tapia and Ortiz 2010). Additionally, some studies have found that universal broadband services have sometimes been mis-targeted or deployed in the wrong locations (e.g., Hudson 2010; Tapia et al. 2011). Other work has suggested that private Internet service providers have felt threatened by these governmental initiatives and have thus taken legal actions and lobbied actively to block them (Hu and Reardon 2005; Hudson 2010).

While the prior literature offers some insight into why most of the governmental initiatives have failed, more research is needed to deepen our theoretical understanding of the complex array of challenges involved in implementing governmental ICT initiatives (Kvasny 2002; Warschauer 2004). Toward this end, some scholars have pointed out that public ICT projects usually involve a variety of parties with diverse motivations and interests (Flak and Rose 2005; Murray et al. 2004), while others have indicated that the consequences of governmental ICT interventions depend on the broader social, political, and economic contexts in which the technology is implemented (Castells 2004; Sy 1999). Indeed, many of the difficulties of ICT implementation

stem from the fact that the technology is embedded in a complex social system. Thus, an understanding of collectively-funded ICT initiatives cannot be achieved without considering the complex interplay among various stakeholders and the impact of contextual factors (Carter et al. 1999; Howcroft et al. 2004; Johns 2006; Kling and Scacchi 1982; Warschauer 2004).

Unfortunately, few studies have examined the interactions between the various stakeholders, how these interactions evolve overtime, and how social, economic, and political factors influence the development and outcomes of these initiatives. This lack of research is understandable since such investigations require longitudinal studies that allow chronicling of the development of governmental ICT interventions, capture the perceptions and responses of important stakeholders (government, legislators, citizens, service providers, etc.), and incorporate a rich set of contextual factors. For this type of study, actor-network theory is a promising framework.

Actor-Network Theory

Every technological artifact is dependent upon a heterogeneous network that supports the use of the artifact. Actor-network theory (ANT) provides a means to analyze the way in which social consequences are built into technologies (e.g., Latour 1996) and the way in which “truths” about the consequences of a technology are socially negotiated and constructed. ANT outlines how heterogeneous networks of human and non-human actors secure their interests and use alliances to enroll other actors into the network (Callon 1986; Latour 1996; Law and Hassard 1999). ANT is concerned with investigating “the creation and maintenance of coextensive networks of human and non-human elements that, in the case of information technology, include people, organizations, software, computer and communications hardware, and infrastructure standards” (Walsham 1997, pp 466f).

According to Callon (1986), actors' identities and interests are revealed during negotiations among human and non-human actors. Two key concepts in ANT are *translation* and *inscription*. Translation refers to the creation of an actor-network through the alignment of interests. The concept of translation is used to characterize how actors' intentions are changed as the actors become allied to an actor-network. The notion of *inscription*, on the other hand, characterizes the intentions of designers and initiators involved in technology.

In ANT, governmental ICT interventions can be seen as translation processes in which the interests of various actors are expressed in terms of specific needs (e.g., connect everyone to the information superhighway) and are enacted through a social policy (e.g., universal broadband Internet access). During the translation process, the specific needs, scenarios for how the technology will be used (*programs of action*), and the roles to be played by actors are inscribed in the artifact. The ultimate success of projects such as LITV rests crucially on the initiating actors' ability to manage the diverse interests of other actors in the network, and mobilize broader support to ensure that the other actors will comply and fulfill their respective roles.

To increase the durability of these interests and to stabilize the network, translations are inscribed in artifacts. Inscription takes place in the interactions among human actors, in the formation of a technology, and in the placement of this technology in an actor-network (Latour 2005).

According to ANT (Callon 1986), translation consists of four major stages: problematization, interessement, enrollment, and mobilization. It should be noted that translation processes might fail at any stage. While the translation stages can often be more fluid and interrelated than Callon's four-stage translation model might suggest (Holmström and Robey 2005; Law and

Hassard 1999), the four translation stages still provide a useful framework for analyzing an actor-network. The four translation stages are described in Table 1

=== insert Table 1 about here ===

METHODOLOGY

Site Selection: LaGrange Internet TV Initiative

LaGrange, with a population of 27,000 comprising 10,000 households, is located 60 miles southwest of Atlanta, Georgia. Socioeconomically disadvantaged LaGrange residents, as in the U.S. in general, tend to include a disproportionate number of individuals who are elderly, female, disabled, members of a racial minority, or members of single-parent families and tend to have less income and education (Hsieh et al. 2008). This profile of the socioeconomically disadvantaged is consistent with those identified in many prior studies (Lam and Lee 2006; Lenhart 2002; NTIA 1998; NTIA 1999; NTIA 2000; NTIA 2002).

The geographical location of LaGrange has two important implications for its telecom infrastructure. First, since the main telecommunication backbones in the United States were built around major metropolitan areas, LaGrange, like most small towns in the U.S., was left behind in terms of telecom and Internet service development (Graham and Marvin 2001; Townsend 2001). The federal government also offered no explicit plan to strengthen the telecom infrastructure in these rural areas. The LaGrange city government viewed this as a threat to their economic development. Thus, the government created a citywide hybrid co-axial and fiber-based network connecting every household in the 1990s (Meader et al. 2001). This hybrid network served as a foundation through which universal broadband access could be offered to LaGrange households. Second, the reception of broadcast TV signals in LaGrange is particularly poor due to its remote location. This provided an opportunity to cable TV service providers to penetrate

this rural market.

In April 2000, based on the hybrid co-axial and fiber-based network that was already used to provide cable TV and broadband services, city officials devised a three-way contract with the cable company (Charter Communications) and an Internet service provider (ISP) (WorldGate Communications) to use the surplus bandwidth to provide an Internet TV service to every household at no additional cost. The plan was to extend this service by providing customers with a **free** TV-based Internet service through the same set-top box that was used to provide the digital cable service. Thus, residents were able to receive a household Internet service without paying anything beyond the basic cable fee of \$8.70 per month. In those few cases where a household wanted to use LITV but could not afford the cable fee, the city was willing to subsidize the cost of the basic cable connection. In other words, the city government intended to make LITV a universal service such that every resident in the city could access the Internet for free.³ From a research perspective, the LITV initiative provided us with a unique opportunity to study a policy intervention that was designed specifically to promote universal broadband access.

Data Collection

Following prior ANT research in the ICT field (Faraj et al. 2004; Walsham and Sahay 1999), our method was informed by contextualism (Pettigrew 1987; Pettigrew 1990; Walsham and Waema 1994) and we aimed to developing a rich understanding of the LITV project by reconstructing the project history, investigating different actor groups' activities and opinions, and examining the social, political, and economic contexts in which those activities and opinions occurred and were shaped. We also attempted to uncover the impact of the political, economic, and social contexts

³ There was obviously a cost associated with providing the service. This cost was collectively shared by the city government, the cable provider, and the internet service provider. For the remainder of the paper, we use the term “free” in describing Lagrange’s internet initiative because that is the way in which it was characterized and marketed by the city and the way in which other actors such as citizens and the media referred to it (e.g., Marcotte 2000; Meader et al. 2001).

on actors' perceptions of the initiative, how different actor groups' perceptions evolved over time, and how their opinions and actions contributed to the outcomes of the initiative. A longitudinal design was chosen because it allowed us to gain a comprehensive and rich understanding of the context and the associated behavioral consequences (Howcroft et al. 2004; Johns 2006), and how the actions and perceptions of different actor groups evolved over time (Walsham and Sahay 1999).

The data were collected over a three-year period from 2001 to 2003. These data, including both archival and primary data, were pulled together to form a case database, which helped us to structure the historical timeline of the project and understand the translation processes through the lens of ANT. The primary data were collected in four phases, as shown in Table 2. The first phase (2001) consisted of 25 interviews with all of the major parties, including city officials, the cable operator, and the ISP. The second phase of the primary data collection (2002) included seven interviews with city officials and council members to obtain their perspectives on the ongoing project. Two years after the inception of the project, about 3500 of the eligible 10000 households had chosen to implement LITV. In the third phase of data collection a large-scale survey (n=900 responses) with open-ended questions was administered to the residents who had installed LITV as well as those who had not yet done so by summer 2003. While the quantitative results of the survey have been reported elsewhere⁴, here we draw upon the qualitative data provided by 147 residents who responded to the open-ended questions. We also conducted 140 telephone interviews to further probe residents' perceptions of the project. These respondents related their experiences and opinions of the technology, the initiative, the service providers, and/or the city government. Shortly after the survey and telephone interviews, the

⁴ The quantitative data were collected based on the positivist lens of technology acceptance theories and capital theories, which are totally different from actor-network theory and the qualitative focus of this paper. The analyses and results of the quantitative data appear in Hsieh et al. (2008) and Hsieh et al. (forthcoming).

initiative was discontinued. During the fourth phase of data collection in late 2003, the city granted us access to conduct interviews (with 28 subjects) in the community center to understand residents' reactions to the termination of the project. All interviews were audio recorded and transcribed.

==== insert Table 2 about here ====

Data Analysis

We followed the recommended procedures for qualitative research and grounded theory (Eisenhardt 1989; Miles and Huberman 1994; Strauss and Corbin 1994). Note that we took the grounded theory approach to coding our data, an approach that is commonly used for analyzing qualitative data; we did not take the grounded theory approach to theory generation.⁵ Specifically, we adopted the “Straussian” approach to grounded theory, which permits researchers' exposure to related literature (ANT in this particular case) to guide the data analysis process (Strauss and Corbin 1994). We followed an iterative coding procedure that involved identifying the emerging concepts, examining empirical evidence for their support, consolidating similar concepts to create more refined ideas, and collecting more data until reaching theoretical saturation. Data analysis was based on the three types of coding suggested by Strauss and Corbin (1990), i.e., open coding, axial coding, and selective coding. The data analysis process was facilitated by using QSR NVivo software, which was designed for managing data complexity and supporting qualitative analysis. We first identified 95 codes during the open coding stage, with each code supported by two or more text segments. During the axial coding stage, we consolidated codes that were conceptually similar. Sample codes and supporting illustrations are given in the appendices, which will be discussed in a later section. Finally, during selective coding we strived to integrate the identified codes and formulate a storyline that offered a

⁵ Myers (2009) has indicated that many qualitative researchers in business and management use grounded theory as a way of coding their data, while others use it as a method of theory generation. We acknowledge such a distinction and, in this research, use the grounded theory approach for data analysis.

coherent and insightful account of the LITV initiative (Boudreau and Robey 2005). Further rounds of data collection and coding were performed until reaching theoretical saturation.

The qualitative and longitudinal research approach resulted in a rich dataset that allowed us to construct a chronology of the project and relate this to the translation stages of ANT. The identification of actors was guided by our reading of the interview transcripts, supplemented by public documents (e.g., case studies, newspaper reports, and magazine articles). In addition to key human actors, we purposefully viewed LITV as the critical technology actant (i.e., non-human actor) and paid particular attention toward its roles and, more importantly, different actor groups' inscriptions into it.

RESULTS

The Political, Economic, and Social Context of the Initiative

Before moving onto the details of each stage of the ANT translation process, we first discuss the political, economic, and social aspects of the environment in which the LITV initiative was implemented. As noted earlier, these contextual factors may directly or indirectly affect the outcomes of such governmental ICT interventions (Carter et al. 1999; Castells 2004; Howcroft et al. 2004; Kling and Scacchi 1982; Sy 1999; Warschauer 2004).

Politically, the city of LaGrange follows the typical U.S. democratic model. The city government performs the administrative function and is under the supervision of the city council, which performs the legislative function. The mayor of LaGrange and the city council members are all elected by LaGrange residents. While all government activities must be legally endorsed by the city council, they must also be politically and economically endorsed. The impact of the government's public policy initiatives on the city's budget is usually a primary concern of the city council. The broad economic context is that LaGrange is situated within the capitalist U.S.

economy and that businesses in LaGrange essentially exist to make a profit. Their survival and market value are dependent on their ability to generate profit and hence returns for their shareholders.

Like most communities in the U.S., there are notable socioeconomic and racial differences between different neighborhoods in LaGrange. Individuals with higher income and better education attainment tend to reside in a few selected areas (see Figures 1 and 2). Coincidentally, whites tend to live in the affluent neighborhoods (Figure 3), whereas blacks tend to live in areas characterized by lower income and education attainment (Figure 4). The distribution of income and education attainment, which suggest one's socioeconomic status (SES) (Jung et al. 2001; Lenhart 2002), correlates with race in a way that shows that blacks are disadvantaged, agreeing with the general pattern of social inequality in the United States (Roscigno and Anisworth-Darnell 1999).

=== insert Figures 1, 2, 3 and 4 about here ===

Problematization: Envisioning a City-Wide Universal High-Speed Internet Service

By 1999, city officials, particularly the mayor of LaGrange (Jeff Lukken), had observed the tremendous business and economic boom stimulated by the Internet. While metropolitan centers such as Silicon Valley, Research Triangle (NC), and New York City thrived, rural areas in the U.S. continued to lag behind in Internet penetration (Graham and Marvin 2001; Townsend 2001). Aware of this, the mayor felt the need to digitally connect the community to enable the city and its residents to take part in the emerging digital economy. He thus championed an initiative aimed at providing free high-speed Internet service to every household in LaGrange.

By providing universal broadband access through the LITV initiative, the mayor envisioned achieving the following objectives: (1) *Bridge the Digital Divide*, (2) *Workforce Development*, and (3) *Economic Development*. These objectives, the mayor's inscriptions with regard to the LITV initiative, were interrelated in that bridging the digital divide would encourage citizens to develop the digital skills needed in the workplace, such as how to use a keyboard or search the Internet; and the development of a digitally literate workforce would attract employers to the area, making LaGrange a more attractive environment for investment.

The materialization of this vision required the endorsement of and participation from various parties, including the government, the council members, the cable and Internet service providers, and the residents to jointly create an actor-network. Hence, the mayor collaborated with other city government officers to draft a written report in which they inscribed their vision. These parties were the actor groups whose attitudes to the project and consequent actions would determine the formation, maintenance and sustainability of the actor-network. Based on our analysis, we identified several relevant actor groups and their constituents (Table 3). The attitudes and actions of the human actors to the LITV initiative at different stages in the translation process are summarized in Table 4.

=== insert Table 3 and Table 4 about here ===

Interessement: A Governmental Initiative with a Profit-Making Agenda

During the interessement stage, the city government took several actions to interest the cable company (Charter), the ISP (WorldGate), and the city council. The city government had already contracted with Charter to offer cable modem and digital cable services. Given the intention to offer a TV-based Internet service through the same set-top box used for the cable service, WorldGate was identified as the only viable Internet service provider that had the capability to deliver Internet access over a cable TV-based system. In this sense, while the city government is

the initiator of the project, Worldgate can be viewed as the technical designer of the LITV service. It was found that Hal Krisbergh, CEO of WorldGate, and Paul Allen, who had acquired Charter, both shared a vision to create a wired society, paralleling the mayor's aim of providing universal access. The CEO of WorldGate said:

We always felt that a major objective of WorldGate as a fundamental business strategy was to provide very low cost Internet access, which in effect would bridge the digital divide ... WorldGate was always very focused on pervasive deployment of the service as a solution to bringing the Internet to the "have nots" of the world.

This initiative also required the political and legal endorsement of the city council. While the council members agreed that this use of the surplus cable bandwidth would benefit the city and its residents; without financial data, council members worried that it would not be cost effective to offer free Internet access. As council member Bobby Traylor recalled:

When it was first proposed, I said, "Wow, where are we going to get the money? I know it would be beneficial, I know it's needed if you're going to bridge this divide. But where in the heck [are] we going to get the money?"

Indeed, the financing of such public policy initiatives is always a central concern. One major contradiction between the free service idea and the service providers' business models is that both WorldGate and Charter needed to consider the earning potential of this project and were accountable to their investors. When asked whether Charter would like to offer the WorldGate service for free, CEO of Charter, Jerry Kent laughed, *"I don't think my stockholders are going to quite go for that."*

Since neither the cable company nor the ISP were interested in giving away something for

nothing, it was clear that the initiating actors would have to structure the arrangement to offer a reasonable-value proposition for all parties concerned. In the cable industry, companies generate substantial revenue through the sales of premium services, such as pay-per-view and video-on-demand. As digital set-top boxes provide the platform for selling more premium services, Charter was drawn into the actor-network by the city's plan to place a digital set-top box in every LaGrange household. Offering 100% penetration of the residential market was very attractive to Charter because it would greatly increase the number of customers with the ability to purchase premium services. Meanwhile, one of the innovative features of the WorldGate system was that it allowed TV viewers to hyperlink from a cable TV channel directly to e-commerce websites. In return for providing this service, WorldGate received \$0.40 per click-through from the sponsor of the hyperlink. WorldGate's business model was predicated on generating a significant amount of revenue through this feature. Given such a business model, it was in WorldGate's interest to expand its subscriber base and the LITV initiative would help them to do exactly that.

To further garner support, the city government offered to take responsibility for promoting the initiative and installing the technology for the cable company. Thus, in the interessement phase, the economic benefits to the companies were promoted, and the marketing and installation were assumed by the city. The city manager, Tom Hall, was able to interest Charter and WorldGate with potential business benefits and convinced them to offer the service at a highly discounted rate. The city manager recalled his conversation with the CEO of Charter when the idea to offer the service for free was first suggested:

We went to Charter and said, "Jerry, you guys want to sell pay-per-view, you guys want to sell digital cable, you guys want to sell all this stuff but in order to do it you've got to get that box out on people's TV[s] ... If we can offer free Internet, the

city will go out and install it for you, we'll market it for you. And I promise you we're going to get some boxes out there on people's TVs and you guys are going to have the opportunity to sell your services in greater numbers [than] you would otherwise." He thought about it and called us back and said, "all right let's see if we can structure something."

Thus, the LITV initiative was inscribed with distinct interests by the different actor groups. From the perspective of the city, the vision of offering high-speed Internet access to every household was predicated on the notion that, for the benefit of all LaGrange residents, the Internet should be available at no financial cost. From the perspective of the cable provider and the ISP, whose value and survival is dependent on their profit-making abilities, the LITV initiative had to be conceived as a market-driven action that had the potential to achieve higher revenue, increased market share, and higher profit. Specifically, the cable provider saw the Worldgate service in a very instrumental way (i.e., as an opportunity to get its set top box in more households and to thereby generate additional revenue as residents purchased more cable services). Worldgate (the ISP) inscribed their service not only as a low cost means for residents to access the Internet, but also as a tool to bring together marketers and consumers (i.e., through channel hyperlinking) in a new way that held the potential to generate revenue for the ISP.

Enrollment

City Government and Suppliers: A Win-Win Situation

During this stage, the government formulated a three-way deal that enrolled the ISP and the cable company to jointly offer a largely discounted service to residents of LaGrange. Under this agreement, the city government would pay WorldGate the ISP fees, which were reduced from the typical range of \$4.95 to \$16.95 per month down to \$0.30 a month per set-top box. The city also agreed to reimburse Charter for part of the \$6.95 monthly fee Charter would have normally collected from customers as payment for use of the digital box. The city prepared a \$296,000

budget to cover the cost for the first 15 months.

Under the agreement, the city organized 15 employees from various city departments, including policemen, firemen, water workers, and code inspectors, to install boxes in residents' homes and to provide the necessary training to operate the WorldGate system. In return for each installation, Charter reimbursed the city \$45. This arrangement imposed very little financial burden on the city and addressed the council members' concern. The council officially endorsed the initiative. Some council members considered the city manager to be an excellent deal maker and credited him for this three-way contract. Councilman Bobby Traylor recalled:

With Tom Hall's initiative ... and going to the table with WorldGate and Charter, and coming back and saying, "Hey we can do it for this." No way in the world we could have done it any better, and I was saying great ... let's move forward.

The LITV service became available in June 2000 and cable subscribers could request the service for no additional charge. Those who did not subscribe to the cable TV service only needed to pay the \$8.70/month fee for the basic cable TV service and for those who could not afford basic cable the city was willing to pay this fee. The city government promoted LITV through direct mail, community centers, the library, newspapers, and radio. By April 2001, about 35% of the eligible households had opted to *enroll* for the free service.

As one of the first municipalities to offer free high-speed Internet to every eligible household in town, the LITV initiative drew considerable media attention and was positively recognized. Both Charter and WorldGate perceived this to be a great benefit for their brand names and service offerings. The VP of Operations for Charter said, *"From a PR standpoint, it's a huge win for everybody all the way round."* The council members also felt that outsiders looked at the city as

being innovative, progressive and forward thinking, which infused a positive energy into the council and the city government. The city manager observed:

We recently were named the finalist in the “Innovations in American Government Program” ... I think we’ve been on CNN four times. Did I think the president of IBM Japan was going to come to talk to me about how we structured our business relationships? The most intelligent city in the world [award]. We actually, I mean competing cities for that award included the cities of New York, Chicago, Toronto, London and Rio. That’s pretty tall company for LaGrange, Georgia.

Residents: Tensions between the Disadvantaged, the Advantaged, and the Government

Despite the efforts of the city government and business partners, a significant portion of the population had not yet chosen to install LITV by the spring of 2001. Since these residents were part of the democratic system in that their opinions had bearing on public policies, we consider them to be part of the actor-network. While there were numerous reasons for their hesitance for adopting LITV, one major discriminating factor was socioeconomic status. This is consistent with prior findings that income and education—which are indicative of one’s socioeconomic status—are the two most important predictors for ICT use and nonuse (Lenhart 2002; Mbarika et al. 2002; Musa et al. 2006; NTIA 1998; NTIA 1999). Life-factors, such as educational attainment, income level, state of health, employment status, and feelings of control and confidence, usually correlate with one another and tend to be lower for the socioeconomically disadvantaged (Borstein and Bradley 2003; Henry 2004; Lam and Lee 2006; Musa et al. 2006; Musa et al. 2005). The discrepancies in the above life-factors between the socioeconomically disadvantaged and advantaged not only affect their life-opportunities and living conditions, but also shape their different worldviews and ways of interpreting surrounding events (Williams 1990).

LaGrange residents' socioeconomic status was a key influence on their differing interpretations of the initiative, in terms of who stood to benefit most from LITV and how much should be paid for access. These interpretations mirrored their distinct identities, interests, and positions in society, e.g., whether they were socioeconomically disadvantaged or advantaged, and whether or not they were part of an ethnic minority. In particular, the socioeconomically disadvantaged tended to emphasize that their survival needs assumed a higher priority than use of the Internet. They also indicated that they were unable to take advantage of the technology due to a lack of requisite resources such as disposable time, physical ability, or even a place to live (see Appendix A for identified codes and illustrations). Some thus criticized the government for providing Internet access rather than taking care of more pressing needs. The above interpretations all highlight the inadequate resource conditions that constantly trouble the disadvantaged.

Among the socioeconomically advantaged who had not yet adopted LITV, there were some who felt strongly about the project and expressed views that were tightly coupled with assumptions about class and race. Their statements were deeply embedded in ideas about race and class, suggesting that if you cannot pay for the service then you should not have it. In particular, some complained that the free Internet service was a waste of taxpayers' money and that the poor should not be subsidized. For instance, an advantaged individual commented, *"I think if the poor want to use the Internet, they should do like I have had to do in the past when I couldn't afford to pay for Internet—go to the library."* Those who already subscribed to Charter's cable TV service felt it was unfair that others were getting cable service for free (see Appendix A for illustrations). Some of these statements were raised in a very strongly-worded fashion. One of the persons interviewed asked, *"When did Hispanic or Latino become the majority in the U.S.?"*, suggesting that the free LITV project was faced with a deeply rooted problem of this heterogeneous society—namely, tensions between racial and ethnic groups. Given the notorious history of racial prejudice in the U.S. (Brown et al. 2000), race played an undeniable role in how the LITV

initiative was interpreted, leading some white residents to conclude that they were subsidizing free Internet access for blacks. Quotes from a white middle-aged male frankly revealed his opinion in this regard and illustrated how long-lasting racial prejudice influenced some of the white residents' attitudes toward the project. For example:

[M]y mom, they have to pay about 80 something bucks a month. It is cable TV and the Internet, the high-speed. They complained about it that all these black people can have it for free, and they have to pay to do what they want to do on the Internet. They are old, they are a bit racist, a little prejudice to the minority. I heard other [white] people complained about that WorldGate stuff, they give it to the blacks, all of a sudden. The whites need to pay to use that kind of stuff.

There were salient attitudinal differences between the disadvantaged and the advantaged who had not installed the technology. While the disadvantaged tended to speak of their life difficulties, the advantaged revealed their self-image as the dominating class and that they believed they were being ripped off by subsidizing the poor or racial minorities. This sharp contrast in terms of the two groups' interpretations essentially reflects the underlying tensions (and power relations) between the privileged and the underprivileged in U.S. society (Castells 1997a; Castells 2004). Since the residents' voices could be heard by the council members and the city government and could thus influence the continuance or discontinuance of the initiative, these tensions between the two groups had the potential to compromise the stability of the actor-network.

In addition to these differing opinions, there were views shared by the two groups. For instance, there were voices from both groups questioning the mayor and the city government's *real* motivations behind the free initiative. There seemed to be a lack of trust in the government and its effort to provide free technology. Some residents suspected that the government was trying to

use LITV as a surveillance device to monitor their behaviors, while others doubted that the service would remain free and were convinced that the government was intending to reap some financial gains out of the service. Council member Nick Wooden concluded, *“So you can’t give me anything free, if you give me something free, it must be part of a government scheme.”* This distrustful attitude could have posed a threat to the legitimacy of the government’s effort.

During the enrollment stage, there were both favorable and unfavorable attitudes and actions from different actor groups (i.e., the government, the service providers, residents who had or had not yet subscribed to the service, and the media). These attitudes and actions can be understood by examining the actors’ standpoints within the social system. The enrollment of the business partners (i.e., WorldGate and Charter), who operated in a capitalistic system, was primarily motivated by the potential for market penetration, revenue growth, and profit. The council members’ concerns reflected the demands for legitimacy and financial feasibility of governmental operations in the U.S political context. Finally, opinions from the socioeconomically disadvantaged and advantaged reflected their relative positions in society.

Mobilization

While the interestment stage concerns how to convince actors to enroll in the network, accept their roles, and hopefully become an active part of the initiative, the mobilization stage focuses on securing continued support from the enrolled actors, thereby stabilizing the network and institutionalizing its underlying ideas. Thus in the mobilization stage, we examined if the enrolled actors’ participation served their interests and whether they continued to support the underlying ideas of the actor-network, thus allowing it to stabilize. In the case of LITV, as reported below, we observed polarized opinions from the advantaged and disadvantaged actors who had personally used LITV, as well as council members’ concerns about the legitimacy and financial sustainability of LITV , suggesting a fragile actor-network.

Actant: LITV

LITV is the focal technology, or the actant, in this initiative. As discussed earlier, different actor groups (i.e., the government, the ISP, the cable TV service provider, and the residents) had inscribed very different meanings into the actant during the problematization, interessement and enrollment stages. Inscriptions made at these stages were typically based on actors' impressions of the initiative rather than on use of the technology. However, once things progressed to the mobilization stage, in which adopters began to have first-hand interaction with (or use of) the technology, the role of the technical features of LITV became quite important in shaping residents' responses to the initiative. Indeed, rather than treating the technology as a black box, it is important to examine its technical features (Orlikowski and Lacono 2001).

Specifically, the LITV initiative used a television-based Internet access device. Subscribers received a free wireless keyboard and digital set-top box, which connected the TV to the cable network. With the wireless keyboard, users could browse the Internet via their TV. At the rate of 158 kbps, the connection speed was nearly three times higher than the typical dial-up service (56 kbps), but still significantly lower than normal cable modem speeds. Subscribers also enjoyed unlimited access, a free email service, 5 MB of web space, and a technical support hotline that was available seven days a week. Training was available in the community center, over cable TV, and through a technical support hotline. Users did not have to install or maintain an operating system or application programs. However, the system did not allow the printing or storage of files, or browsing of websites that required software plug-ins (such as Adobe Acrobat and Apple QuickTime). Also, users could not browse the Internet and watch TV simultaneously.

These technical features were subject to interpretation by the different actor groups. While LITV was more limited in its capability than a personal computer, the technology was easier to operate and maintain because of its thin client architecture. This simplicity in terms of technical design

and functionality meant that fewer financial resources were required for installation and upkeep. For the government, LITV represented a viable solution for reaching those who otherwise could not afford high-speed household Internet access and explore all that it has to offer. For the enrolled participants, however, the nature of this technology elicited quite different reactions from the socioeconomically advantaged compared to the socioeconomically disadvantaged.

Residents

After directly interacting with the technology, the socioeconomically advantaged and disadvantaged groups developed polarized views towards the initiative. The disadvantaged users tended to express high satisfaction with LITV. The ability to surf the Internet infused them with a sense of digital participation. One female resident with only elementary school education expressed her joyfulness, “*And then I realized, ‘hey, I can go on the Internet’ (laughed quite happily).*” The disadvantaged also perceived economic, educational, social, and health benefits derived from using the service (see Appendix B for identified codes and illustrations). There was evidence that students in low-income families used LITV for class and learning purposes. Some of the disadvantaged users without any prior computer experience could apply the acquired digital skills in their current job tasks. In addition, some of the disadvantaged were disabled and/or suffering from chronic diseases. There was evidence suggesting that they were able to use the Internet to search for health-related information and knowledge that helped to maintain or improve their physical or mental conditions. Some of them suffered from mental problems and were able to obtain social support to improve their situation. Tom Gore, one of the council members who was also a medical doctor, described one such example:

I have one real glory story from one of my patients, she was financially strapped, did not have any income. She was using this and, actually for her, it brought her out of depression. Because she was very depressed, and she was able to make

human contact with people all over the world. And she had friends she would correspond with in India and other countries. It [Internet TV] was the thing [that] brought her out of the medical depression.

It was also common among the disadvantaged to have a feeling that the technology would benefit “everyone”, or everyone should have the service. A retired senior resident living with his spouse shared his opinions:

The Internet TV is very important to me. I find it most useful and helpful. My wife and I are the only ones at this address. I am the only one who actively operates the equipment. However, it is not unusual for her to ask me to use the equipment for some purpose she has in mind, so both of us profit from it. I think the city did a great deed when they decided to furnish this service. And I hope they will continue to do so. I think the Internet is easy to use and I think everyone should use it. I intend to use it myself as long as I am able.

By contrast, the socioeconomically advantaged users, given their prior computer experience and ownership of better technologies that reflect their superior socioeconomic status, often viewed LITV as inferior to a PC with a broadband connection (see Appendix B for illustrations). They tended to judge the value of LITV based on their prior knowledge about personal computers. For instance, they devalued LITV because it did not come with typical PC peripherals such as a CD drive, printer, or scanner. Some complained about the poor display of Internet content on a TV screen. With her professional web design background, a female with a doctoral degree was able to point out that this problem was due to the mismatch between TV screen resolution and webpage design.⁶ The view of the advantaged that LITV was an inferior technology was perhaps

⁶ At the time of data collection, the typical TV resolution was 640*480 pixels, whereas webpages were usually designed to be displayed as 800*600 pixels.

best captured by the comment offered by one advantaged user, *“LITV is a real Mickey Mouse way of going to the Internet”*. Moreover, there were voices raised against the project from some advantaged users that it was informed by good intentions, but lacking in execution. In particular, some of the advantaged users developed a perception that the LITV initiative missed a large fraction of the target audience—namely, the socioeconomically disadvantaged—while others found it slow and tedious, and limited in terms of its functionality.

City Government and Suppliers: Mixed Signals for Actor-Network Stability

Two years after the implementation, council members heard various positive and negative accounts. On the positive side, council members heard stories that encouraged them to continue supporting the LITV initiative. As Council member Tom Gore indicated, *“I do have a lot of people saying they like it [and] appreciated it.”* Council member George Moore recalled, *“I’ve run across a few that have not used it, but those who are using it are really happy and pleased with it.”* On the negative side, council members received feedback from residents criticizing LITV as a waste of taxpayers’ money and asking for its termination, thus questioning the legitimacy of the initiative.

In addition to the issue of legitimacy, the ongoing financial viability of the initiative surfaced as another challenge to the stability of the actor-network. Specifically, support among the council wavered after the burst of the dot-com bubble in early 2002. During this period, conditions in the wider economic environment shifted unfavorably for both private and public organizations. As a result, the annual budget of the city decreased. The city government was also subject to tighter budget control and had to provide stronger justification for expenditures. In response, some members said that the council should have a harder look at the project.

In August 2002, the first and third authors personally observed the council meeting. During the

meeting, concerns were raised by council members about the cost and number of people using LITV. Facing these concerns, the mayor and the city manager strived to persuade the council members. The city manager, Tom Hall, reported that the city was able to negotiate with Charter and WorldGate to keep the deal intact for another year for an additional \$170,000. In addition, based on their analysis of usage data provided by the ISP, he informed the council that the highest gain in technology proficiency was identified among socioeconomically disadvantaged families, the average household usage was a little over seven hours a week, and those who liked and used LITV most were those who had no PC or cable modem at home. Thus, socioeconomically disadvantaged households became important actors used to legitimize the continuation of the project.

Hall also emphasized that \$170,000 would represent only a small fraction of the city's \$7 million annual budget. Many council members, however, did not think \$170,000 was a small amount. In addressing their concerns, the mayor thanked the city manager for negotiating the deal and offered further personal observations of LaGrange residents who had successfully used LITV. By the end of this meeting, the council voted for continuation of the project, holding the network together for another year.

Project Termination and Aftermath

There were many factors threatening the stability of the actor-network including the dissatisfaction of many socioeconomically advantaged households, criticism from some advantaged citizens that this was not a legitimate use of taxpayer money, and distrust from some citizens regarding the government's intentions. Moreover, by the end of 2002, two years into the LITV implementation, neither the cable company nor the ISP had realized the expected profit, which was one of the main reasons they had originally signed up to the initiative. This was understandable since the advantaged, who had more disposable income for buying premium

services like pay-per-view and video-on-demand, were not the primary users of LITV.

What ultimately broke the actor-network was that by 2003 WorldGate was running out of cash and facing the prospect of bankruptcy.⁷ Consequently, WorldGate was forced to inform the city government about their financial uncertainty and that the Internet service might be terminated at any time. The project was eventually terminated in late 2003 due to the inability of WorldGate to continue offering the Internet service and the city government's inability to find an alternative ISP.

The breakdown of the network was especially hard for the socioeconomically disadvantaged who had embraced the technology. During the last round of interviews that occurred immediately before the project ended, many of these individuals expressed their confusion and frustration at the termination. Mary, a high-school-educated middle-aged black female put it this way:

I hate it when they got the thing down. I hate it because I got so accustomed to it, it was easy to log on, when the service is up, I can search much faster. I would sit back here and search the web rather than watch the TV. I guess I was kind of frustrated. Then I understand the funding was gone, that was it. You got some people that can't leave home, that is the only way they can pay bills online and get in touch with the world.

Although some disadvantaged residents had acquired skills and developed quite positive attitudes toward digital technologies in general, cost remained a barrier to acquiring an Internet PC. There was a sentiment of desperation among some of these disadvantaged users, which reflected their passive position in the entire initiative, their inability to control or reverse the

⁷ Ultimately, WorldGate was forced to abandon the ISP business and redefine itself in order to remain viable. They are now marketing personal videophones.

situation, and their helplessness in the social system. A white male with high school education described his experience, *“It came as a gift and they took it away the same way.”* At the end of interview, he asked the first author in a quite gloomy tone, *“You are going to see us back on that Internet TV, right?”* A female middle-aged resident who lived in a low-income neighborhood and used Internet TV almost on a daily basis pleaded to the first author during an interview in her home, *“Please don’t take it away. I cannot live without it.”*

DISCUSSION AND IMPLICATIONS FOR THEORY

The results provide a comprehensive understanding of the evolution of a municipal public policy initiative designed to provide universal high-speed Internet access. Our findings shed light on the various factors that contributed to the instability and breakdown of the actor-network. We synthesize and illustrate our key findings in Figure 5⁸ and discuss their implications for theory.

=== insert Figure 5 about here ===

This research represents a significant contribution to the literature on public ICT policy, as it is one of the first longitudinal studies that has applied actor-network theory to gain insights into the implementation of a public policy that aimed at providing universal broadband Internet access. It is also a response to the call for managerial research into critical public policy issues (Lytras 2005; Rynes and Shapiro 2005), including government efforts for attaining universal Internet access and bridging the digital divide (DiMaggio et al. 2004). Our application of the actor-network perspective to the study of governmental ICT initiatives has important implications for public ICT policy and ICT research. Specifically, the actor-network lens offered us a systematic framework to: (1) comprehend the dynamics of the policy implementation process, (2) identify actions and

⁸ We only include the core actor groups in Figure 5. As we view the media as a peripheral actor group, it is excluded from Figure 5.

attitudes of different actor groups to the LITV initiative, and (3) understand how opinions and activities of one actor group complement or compete with those of others, thereby supporting or compromising the stability of the actor network. More importantly, our explicit consideration and inclusion of contextual factors (i.e., social, political, and economic factors) complements ANT and plays a critical role in developing a deeper and more holistic understanding of the phenomenon of interest (Carter et al. 1999; Howcroft et al. 2004; Johns 2006).

This study contributes to our understanding of why most public universal Internet access initiatives have been plagued with difficulties in the U.S. While prior studies have suggested reasons ranging from simplistic views about technology and society to resistance from telecom corporations, our findings suggest that the answer lies in the delicate translation processes through which the interests of various actors are negotiated, and importantly, how the external macro contexts affect the evolution of the translation processes across different stages. Specifically, through our analyses above, we have shown that the demise of the LITV project was due to the translation processes coming to a halt. In the first stage, the initiators inscribe in the artifact certain actor-values depending on the initiators' desired outcomes and their perceptions of the profiles of the anticipated actors. In other words, there are explicit and/or implicit assumptions and expectations about different actors (Akrich 1992; Akrich and Latour 1992). Thus, from the initiators' point of view, the technology is open to only certain types of interactions from particular actor groups. However, the translations involve different actor groups at different stages of the process. It is evident in the present case that LITV was inscribed very differently by various actor groups. While some of the inscriptions favored the creation and continuance of the actor-network, other inscriptions, typically those unforeseen by the initiators, compromised the actor-network.

From the perspective of ANT, the inscriptions that different actor groups applied to the

technology demonstrate a variety of tensions among actor groups (Figure 5) that threatened the stability of the actor-network. First, there were conflicts between the government's free universal service objective and the service providers' profit-making agenda. For the mayor, the city manager, and the city council, providing universal Internet access for free would bridge the digital divide, facilitate workforce development, and stimulate economic growth. Although the service providers, WorldGate and Charter, also had a vision of pervasive network access, they also inscribed the initiative with market-growth and profit-making potential. LITV was, therefore, an initiative with two competing goals.

In addition, there were tensions between the government and the residents. During the enrollment stage, for some socioeconomically disadvantaged residents who had not yet subscribed to the service, LITV was viewed as a service with low priority or as a good technology that could not be utilized because of other life difficulties or inadequate resource conditions. The advantaged who had not adopted the technology criticized the initiative as a waste of time and money and some saw it as an unfair use of taxpayers' money. Further, some individuals from both groups suspected that LITV was a tool for monitoring their activities or for other hidden schemes.

There were also salient conflicts between the socioeconomically disadvantaged and the advantaged that took on racial overtones. In particular, many advantaged residents believed they were deprived since they had to subsidize LITV for racial and ethnic minorities, socioeconomically disadvantaged families, and others to whom they believed themselves to be superior. For advantaged users, especially those who had more sophisticated computer knowledge and experience, the technical and symbolic inferiority of LITV, compared to an Internet PC, led them to conclude that LITV was a misguided initiative that only served the interests of inferior groups of people.

While the LITV service was intended to be “free”, it was not really free for many actor groups. Although the technology was nominally made free for individual residents, the disadvantaged, relative to the advantaged, still face higher marginal financial cost (e.g., basic cable TV charge) and non-financial cost (e.g., knowledge, skills, opportunities, and social support) to make adequate use of the technology. In this vein, digital inequality is essentially a reflection of deeper social inequalities (e.g., income and education) that have been well documented for decades (citation here). Unfortunately, disparities in these dimensions are getting worse in most capitalistic market-based economies like the U.S. (citation), making it increasingly difficult to address the issue of digital inequality in a meaningful way. There was also clear evidence that some members of the dominating groups (i.e., the socioeconomically advantaged and the racial and ethnic majorities) intended to *exclude* the dominated groups (i.e. the socioeconomically disadvantaged and the racial and ethnic minorities) from participating in the digital world, making it difficult to treat LITV as a universal service in the social system. Moreover, while the LITV initiative was constructed as a *free* service, there was cost for the government, the cable company, and the Internet service providers. LITV was also a business proposition to industry partners; these two competing goals, free service versus profit-making, proved to be difficult to reconcile, and resulted in the demise of the actor-network.

Calls have been made for ICT researchers to include both micro and macro dimensions in our studies by extending ANT to include issues pertaining to social structures (Rose et al. 2005). By incorporating agencies both on the micro and macro levels we explored the ways in which the LITV project was shaped over time and how the generative links between micro and macro levels played a key part. The LITV project involved the creation of sociotechnical realities, but was also shaped by the enduring social structures. Clearly, the process of translation by which the will of one actor is transferred to another actor becomes more difficult as more actors are brought into the network, because each additional actor is already part of other networks that might have

aligned them to different and competing goals. To understand the actors' identities and interests it is necessary to consider the environment in which their everyday activities were performed prior to participating in the current network. Consideration of the broader political, economic, and societal contexts and the various actors' positions within these arenas allowed us to understand the rationales behind their interpretations (Carter et al. 1999; Howcroft et al. 2004; Johns 2006). In this study, the political context (i.e., the democratic process and the requirement for legitimacy), the capitalistic economic environment, and the societal structure characterized by socioeconomic and racial inequalities and individualism, which puts self-interest above collective welfare (Figure 5), played a significant role in shaping the translation and inscription processes. Our findings therefore provide concrete empirical illustrations that the implementation and consequences of governmental ICT interventions, particularly public policies that intend to make Internet access as available to everyone at the lowest possible cost or even for free, are contingent upon the influence of political, economic, and social contexts.

The process of constructing the LITV initiative was not purely local; it resulted from local decisions made within the broader context. In reflecting on the ways in which the political context, economic environment, and societal structure may have constrained or enabled local actions and influenced their outcomes, our analysis used ANT to situate the local within the macro (Kleczun 2004). We agree with Truex et al. (2006) that ICT scholars can contribute not only to cumulative theory in ICT but also to cumulative theory in the field from which their theoretical tools are borrowed. A unique and important contribution of this study to the ANT literature is our incorporation of macro factors (i.e., the political context, economic environment, and societal structure) into ANT analysis. In particular, this study contributes to the ANT literature by addressing two criticisms that have been leveled against ANT: (1) that ANT has a "flat ontology" that refuses to assign *a priori* attribution of macro structures in the analysis of the interest, needs and actions of actants (Montiero 2000), and (2) that ANT is apolitical in its failure to take into

account that there may be power relations that affect technological change beyond those revealed by studying the immediate needs, interests, and actions of only those actors enrolled in the network (Feenberg 1991).

Moreover, from the perspective of ANT, a particular technology itself has no inertia but is moved actively by each social actor with whom it comes in contact. At the beginning of the present project these translations failed to work smoothly, and the enrollment of heterogeneous elements into the actor-network was fragile and contested (e.g., conflicts between the ideal of a free service and the profit-making agenda, tensions between the socioeconomically disadvantaged and advantaged). As actors were ultimately unfaithful to their assigned roles (Hanseth and Braa 1998) (e.g., less-than-universal enrollment, criticism of the government and the initiative, and service termination), network stability could not be taken for granted (see Callon 1986; Latour 1996; Law and Callon 1992). In the case of LITV, when the service served the interests of a particular actor group, it underwent a sequence of translations that depended on the group's perception of its possible use and outcomes. Nevertheless, the beneficiaries seldom encompassed all actor groups. In other words, not all actor groups involved in this project could realize the promised/touted benefits, thus making the network fragile and causing it to eventually fall apart. Unfortunately, no efforts were made by either the city government or the service providers to effectively address this issue and the processes of translation came to a halt. The medium, the LITV, lost its meaning as it failed to serve as a valuable instrument for those who were knowledgeable or had access to more advanced ICT and for business partners who needed profit for survival. But while the medium lost its meaning, the overall translation processes—and the whole notion of universal access—should have been ongoing with a constant search for an alternative solution that would allow others to be enrolled in the actor-network without losing those who had already embraced LITV. Unfortunately, there was no search for any alternative solution to rescue and sustain the actor-network. Toward this end, the

current study contributes to the ANT literature by demonstrating how a technological infrastructure relates to the translation, or lack thereof. This research empirically illustrates how ideas are inscribed into technology, and how such inscriptions shape the translation trajectory.

DISCUSSION AND IMPLICATIONS FOR PRACTICE

With perhaps a few exceptions, most U.S. municipal broadband Internet experiments appear to be failing. Why? As discussed earlier, digital inequality is nested within and compounded by deep-rooted social inequalities (e.g., income and education). Regrettably, market-based economies only make the rich richer and the poor poorer (i.e., Matthew effect), making it even more challenging to address digital inequality. Toward this end, government-based policy interventions that pool resources from multiple groups offer a potential solution (citations), albeit one that is quite fragile. As Olfman and Mandviwalla (1994) have noted, collectively-funded initiatives like LITV involve numerous stakeholders with diverse interests and motivations associated with these initiatives. Thus, in addition to technical and financial barriers, there are also political and social issues that are preventing the creation of the stable actor-networks that are needed for sustainable universal Internet access and that these problems are not unique to LITV. Although, there are those who suggest that the problem can be resolved through the use of newer technologies such as WiMAX, we believe that similar problems will emerge. In an opinion piece that appeared in PC Magazine, Dan Costa (2008) put his finger on something that resonates with our own view:

With all great public projects, the support of the middle class is essential. Right now, that support for muni Wi-Fi is elusive ... When I log on to the Web at my apartment in Hoboken, New Jersey, I see 11 Wi-Fi networks, half of them open. So why should my neighbors and I pay taxes for muni Wi-Fi?

Whether socioeconomically advantaged citizens in the U.S. are willing to have their tax dollars go toward subsidizing broadband Internet access for the socioeconomically disadvantaged is a delicate issue that must be dealt with. This is a political and social issue that may be difficult to address in the U.S. where 37 million people (12.3%) live in poverty (DeNavas-Walt et al. 2006), and 35.5 million people (11.8%) live in food-insecure households (Nord et al. 2006). The U.S. worldview is often described as individualistic, with people thinking of themselves in isolation and imagining that they have control over their own destiny. Because Americans tend to focus on their personal material comfort and economic advancement while turning their back on public structures and social services for less privileged citizens, it would be extremely difficult to foster a shared attitude to treat Internet access as a service that every citizen is entitled to have for free. Although U.S. social policies such as Medicare and Social Security, which provide medical and financial assistance to Americans over the age of 65, tend to succeed because they appear to benefit everyone, as the recent debate over healthcare-reform legislation shows, many Americans believe that it is inappropriate for the government to effectively mandate universal health insurance and to intervene in this sector of the economy, and that free-market solutions are to be preferred over government-based initiatives. We speculate that one reason for the divisiveness over healthcare-reform legislation is similar to what we observed in this study; that is, those who can already afford health insurance do not see the benefit of the legislation—rather they see only the potential cost of subsidizing the cost of coverage for those who cannot presently afford it. Likewise, we suspect that the prospect of the government providing universal broadband provokes a similar reaction from the majority of Americans, because it is perceived as an income redistribution initiative that favors socioeconomically disadvantaged groups and cuts against the notion of a free market economy in which firms compete to provide such services to consumers. In this sense, universal access is similar to Affirmative Action which attempts to overcome generations of discrimination against women and minorities. Thus, many Americans perceive a zero-sum game in which uplifting disadvantaged groups is seen as minimizing the

relative advantages held by more privileged groups. When targeting additional resources to socioeconomically disadvantaged groups in a societal context like that of the U.S., policymakers must be prepared for a backlash from the better-off Americans who see these programs as unfair and worthy of opposition, as well as from individuals who are proponents of smaller government and who favor free-market based solutions.

Government institutions in countries like the U.S. are subject to conditions shaped by the market-based political environment. In this market-driven context, less governmental intervention is believed to permit competition that leads to market efficiency based on economic rationality. Governmental intervention to provide services that can be more efficiently offered by the private sector is seen as undesirable. If the Internet is still viewed by the majority as a commercial product that is consumed on the basis of one's ability to pay rather than a service that could be provided universally to all citizens, then municipal broadband Internet initiatives that are launched with the aim of promoting universal access will continue to face opposition in market-based environments such as the U.S.

The message for policy makers is simple: beware of implementing universal broadband initiatives in a political and social environment that is not conducive to using taxpayer money for what may be perceived to be a service that benefits only the socioeconomically disadvantaged. The offer of such a service will not have broad-based support and policy makers will likely have to make too many compromises with respect to the technology in order to launch the initiative without generating criticism regarding inappropriate use of public funds. In the case of LaGrange, we see that in order to offer the service, the city government needed to construct a fragile alliance of actors—in essence, a public-private partnership whereby the companies who were recruited into the network expected to eventually make a profit. When this did not occur, the actor-network collapsed. Thus, while it may seem obvious, policy makers must take the political

and social environment carefully into account when deciding what is and is not feasible in the promotion of universal broadband access.

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Table 1: The Four Stages of Translation in ANT	
Translation Stage	Description
Problematization	During the problematization stage, the initiating actors define the problem to be solved, as well as the identities and interests of other actors that are consistent with the interests of the initiating actors. Initiating actors may also position themselves as an indispensable resource in the solution of the problems that they have defined, and in doing so establish themselves as an “obligatory passage point” (Callon 1986) between the other actors and the network.
Interessement	In interessement, initiators attempt to lock allies into place by negotiating the terms of their involvement, and by using incentives to engage entities not yet involved in the network. Interessement, therefore, involves convincing other actors that the interests defined by the initiators are in line with their own interests. Callon posits that successful interessement “confirms (more or less completely) the validity of the problematization and the alliances it implies” (Callon 1986, pp 209-10).

Enrollment	When actors' accept the roles defined during interessement, the actors are enrolled in the network. However, this acceptance is not easily obtained because actors do not simply yield to the will of the initiating actors. During enrollment, negotiations, trials of strengths, tricks and other strategies are used to convince actors to not only accept their roles but also to embrace the underlying ideas of the growing actor-network and to become an active part of the whole project.
Mobilization	In the final stage of translation, mobilization, initiators try to ensure that allied spokespersons act according to the agreement and do not betray the initiators' interests. Building on the network of enrolled actors, initiators seek to secure continued support of the underlying ideas from the enrolled actors. With allies mobilized, an actor-network achieves stability. This stability implies that the actor-network and its underlying ideas have become institutionalized and are no longer seen as controversial.

Table 2: Scope of the Case Study		
Archival data	News from the local, state, and national media (radio, TV, newspaper, magazines, etc.) and case studies Reports from academic research institutes	
Primary data	Number of Respondents	Respondents
Phase 1	25 Interviews	LaGrange City Officials Charter Communications (Cable TV operator) WorldGate (Internet Service Provider)
Phase 2	7 Interviews	LaGrange Council Members LaGrange City Officials
Phase 3	147 Qualitative Response 140 Phone Interviews	LaGrange Residents LaGrange Residents
Phase 4	28 Interviews	LaGrange Residents

Table 3: Actor Groups and Constituents	
Actor Group	Constituents
City Government	City Mayor
	City Manager
	City Council
Service Providers	Cable TV Operator (Charter Communication)
	Internet Service Provider (WorldGate Communication)
Residents*	Socioeconomically disadvantaged (SED) residents
	Socioeconomically advantaged (SEA) residents
The Media	Newspapers, magazines, TV and radio stations
Actant	LITV

* We differentiate between SED and SEA residents because the initiative was targeted at SED households that would otherwise not have had Internet access. Following the approach by Hsieh et al. (2008 & forthcoming), we used cluster analysis with income and education as discriminants to classify residents into SEA and SED groups.

Table 4: Attitudes and Actions of Actors to the LITV initiative at Different Translation Stages

Actor Group Stage	Mayor	City Officers	Council Members	Service Providers	The Media	SED Residents	SEA Residents
Problematization	- envision a universal broadband service that can achieve multiple benefits for LaGrange						
Interessement	- promote the plan	- identify potential service providers - promote the idea to the council and service providers	- share the universal access vision - concern for financial resources	- share the vision to create a wired society - hope for potential market and profit			
Enrollment	- promote the plan	- structure the deal - promote the plan - help with installation - offer training	- endorse the plan - promote the plan	- participate - provide service	- wide coverage - good recognition - promote the plan	comments from non-participants: - survival first - constraint in other resources - distrust in the govt.	comments from non-participants: - waste of tax money - unfair subsidy
Mobilization	- promote the plan	- promote the plan - identify financial resources	- concern for financial resources	- financial pressure - intend to charge for service		comments from participants: - LITV is for everyone	comments from participants: - inferior technology - bad execution
Post-Termination				- bankrupt - terminate service		comments from participants: - I can't live without it - please bring it back	

* Actant: LITV

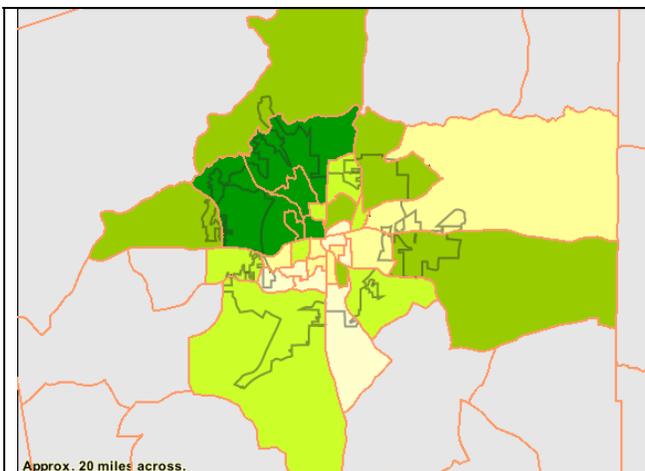


Figure 1: % of people \geq 25 with Bachelor Degree or higher

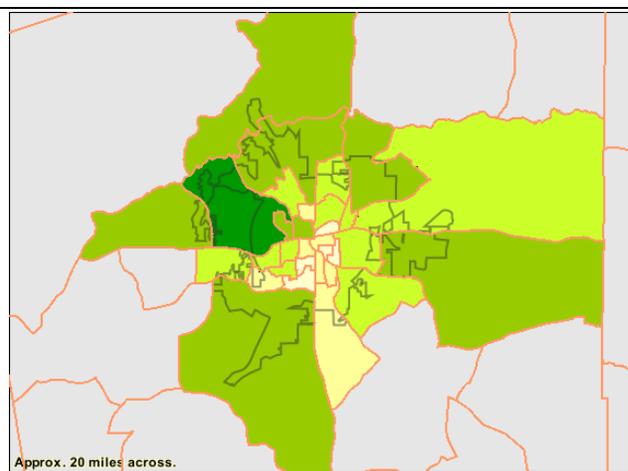


Figure 2: Median Household Income

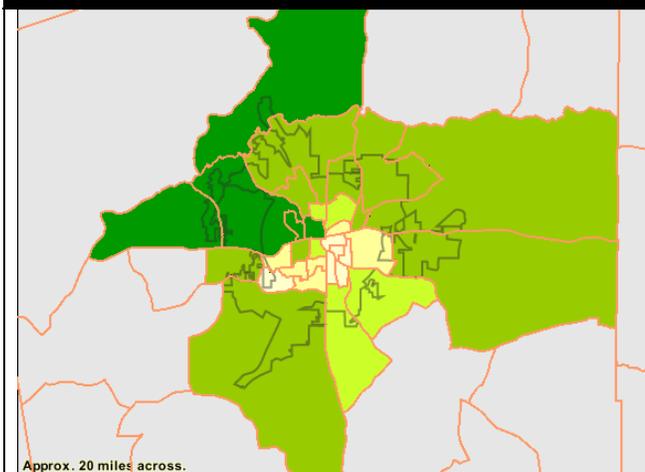


Figure 3: % of people who are White

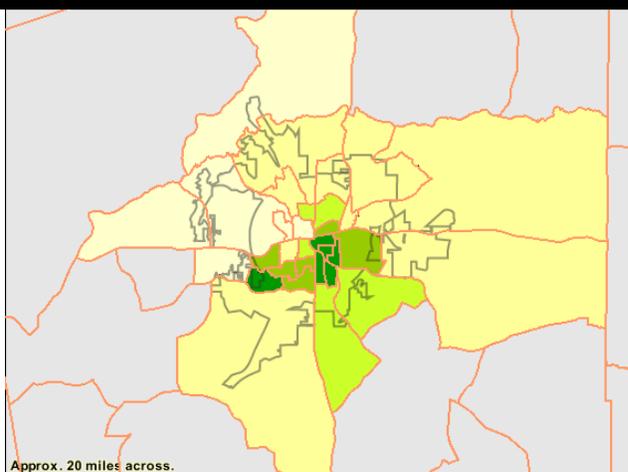


Figure 4: % of people who are Black

1. The thematic maps are retrieved from the U.S. Census Bureau website using 2000 Summary File 3 as the data source.
 2. The city boundary is marked in black.
 3. Block boundaries are marked in orange. A block is the smallest census unit for which data about income and education are available.
- For each metric, the blocks are colored according to quintiles, from pale yellow (lowest 20%) to dark green (highest 20%).

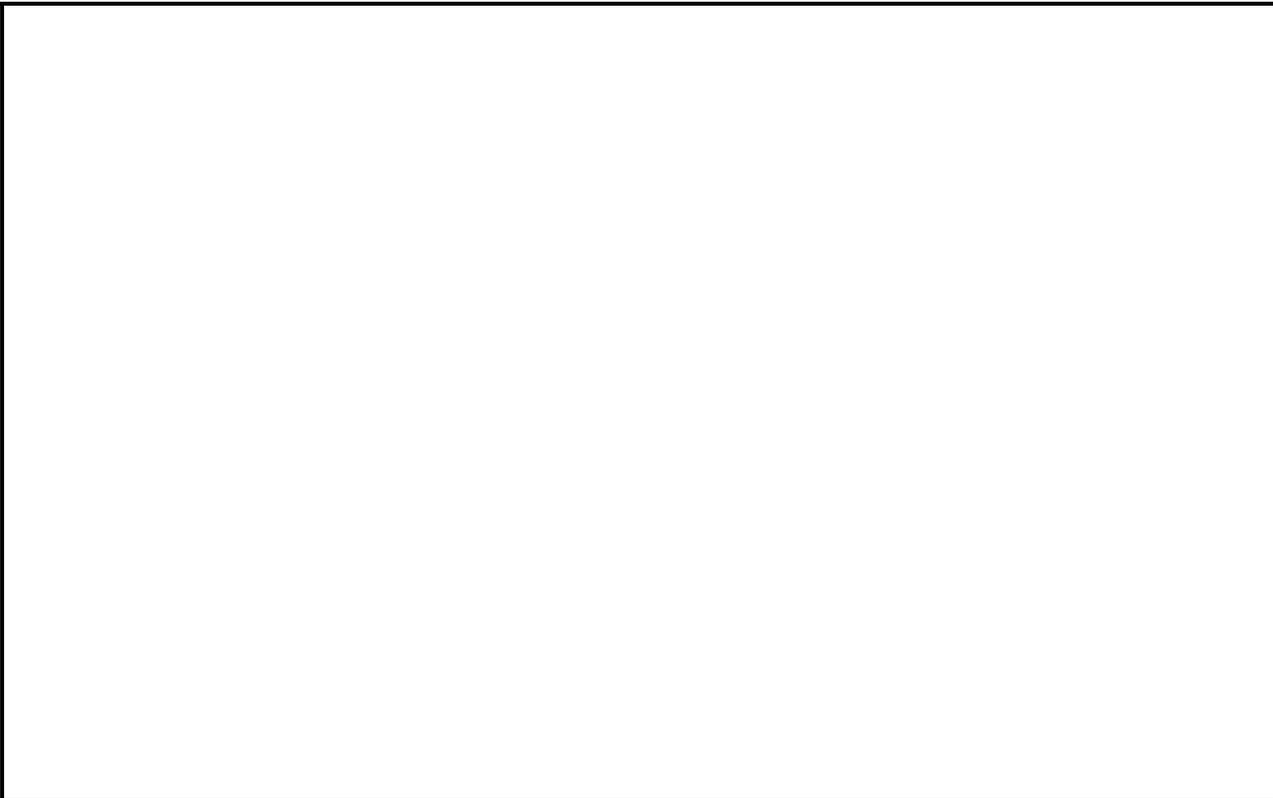


Figure 5: The LITV Actor Network & Contextual Factors

APPENDIX A: Examples of attitudes of residents who had not yet installed LITV

Actor Group	Concepts (codes)	Data Source	Quotation, Opinions, or Observations
The socio-economically disadvantaged	<ul style="list-style-type: none"> • survival first 	A middle-aged African American male in a low-income area	“I don’t know why the Mayor instituted this initiative. I don’t believe what he says. Utility bill reductions help poor people more than free Internet. No lights, no Internet. No healthcare, no need for Internet ... Internet may be good, but survival is what’s important, not some computer games for people who have credit cards. What — to spy on movie stars, or buy junk they can’t afford or [don’t] need?”
The socio-economically disadvantaged	<ul style="list-style-type: none"> • survival first 	Personal observation by the first author	This was a middle-aged white female I encountered in front of the LaGrange community library. I asked her if she had heard about the Internet TV project. She responded that she heard of the project, and she thought it would be very good and useful to have that in her life. But the difficulty she faced was that she had some financial problems and did not even have a place to live. She literally lived in her car. (She showed me the car and a lot of stuff she carried to support her basic life). Meanwhile, she was in a very bad physical condition and had a lot of medical problems. Using Internet TV was logistically impossible given her situation, although she was aware of and interested in the project.
The socio-economically disadvantaged	<ul style="list-style-type: none"> • survival first • lack of complementary resources 	A white middle-aged single mother with three children	“I am divorced and I have to take care of these three children. I know the Internet can be good, but I have to work three jobs now to support the family. I still think it would be very good. When I have more time, maybe I will look into the TV Internet thing.”
The socio-economically disadvantaged	<ul style="list-style-type: none"> • lack of complementary resources 	An African American female in her 40’s in a low-income area	“I thought it would be good. I got diabetes and that causes my eye problem. I cannot see! If I could see, I would like to use that TV Internet. But I don’t see! I have no knowledge about computers or Internet.”
The socio-economically disadvantaged	<ul style="list-style-type: none"> • motivation questioned * 	Quotes from council member Nick Wooden about residents in the public housing project	“Yeah, this is strange... they thought we [the government] were spying on them. I mean that sounds funny, but they really do think that you are spying on them, and you know I guess in a way it’s probably possible even though I know we’re not doing that. But, you know, they don’t trust us. So you can’t give me anything free, if you give me something free, it must be part of a government scheme.”

The socio-economically disadvantaged	<ul style="list-style-type: none"> • motivation questioned * 	Quotes from the city manager discussing opinions of residents in public housing project	“A number of folks were concerned that ‘I don’t know about this box you’re putting in my house, you’re going to be watching me’... ‘Alright, what’s the deal? You’re putting this box in my house that’s going to use a lot of electricity, so my electricity bill goes up, and you guys cash out’”.
The socio-economically advantaged	<ul style="list-style-type: none"> • waste of taxpayers’ money 	A middle-aged socioeconomically advantaged White male	“The people I know who have it are very low income families who cannot afford anything else. They have no computer knowledge and no Internet knowledge at all. I personally think it is a waste of our money.”
The socio-economically advantaged	<ul style="list-style-type: none"> • waste of taxpayers’ money 	Quotes from council member Nick Wooden	“The people say we wasting taxpayers money. That’s always what you got. You got some people if you gave them all the gold apples there they would want to, they would want some people not to have it and there’s just some people you’re never gonna please and they is that’s the downside.”
The socio-economically advantaged	<ul style="list-style-type: none"> • don’t use it if can’t afford it 	A white male with a postgraduate degree in his 30’s	“I think if the poor want to use the Internet, they should do like I have had to do in the past when I couldn’t afford to pay for Internet — go to the library.”
The socio-economically advantaged	<ul style="list-style-type: none"> • unfair use of taxpayers’ money 	A socio-economically advantaged white male in his 30’s	“I hope [the] government is not actually paying Charter for this service. If Charter says they are providing it free, I would ask back the \$52 monthly cable bill which is way too high. Charter has a monopoly power.”
The socio-economically advantaged	<ul style="list-style-type: none"> • racial prejudice 	A white male in his 40’s	“... my mom, they have to pay about 80 something bucks a month. It is cable TV and the Internet, the high-speed. They complained about it that all these black people can have it for free, and they have to pay to do what they want to do on the Internet ... I heard other people complained about that WorldGate stuff, they give it to the blacks, all of a sudden. The whites need to pay to use that kind of stuff.”
The socio-economically advantaged	<ul style="list-style-type: none"> • motivation questioned * 	A white female with a postgraduate degree at her 40’s	“Guess I never could shake the feeling that there would be some gimmick attached.”

* The socioeconomically disadvantaged and advantaged shared this attitude.

APPENDIX B: Examples of attitudes of residents who had used LITV

Actor Group	Concepts (codes)	Data Source	Quotation, Opinions, or Observations
The socio-economically disadvantaged		Quotes from council member Tom Gore, also a medical doctor	"I have one real glory story from one of my patients, she was financially strapped, didn't have any income. She was using this and actually for her, it brought her out of depression. Because she was very depressed, and she was able to make human contact with people all around the world. And she had friends she would correspond with in India and other countries. It [Internet TV] was the thing [that] brought her out of the medical depression. So that's one example, that's just one person. But you hear [a] story like that, you think there must be more... I do have a lot of people saying they like it, appreciated it. In fact, we will give it to them free, elderly patients, poor individuals. I didn't have a lot of African American people who would tell me they used it, but I expect you would hear that from some the other council members."
The socio-economically disadvantaged	• concrete benefits from LITV use	A middle-aged white female with only elementary education attainment and limited prior computer exposure	"I had two open heart surgeries and a stroke. I did go in there and checked out medicines. If there are things I don't understand, I would go on site and seek knowledge. It did make me feel better about things. As we got more familiar and used to it being there and around, we used it more and more. It's like, 'yeah, we are going to Internet', you know... And then I realized, hey, I can go on the Internet (laughs quite happily)."
The socio-economically disadvantaged	• concrete benefits from LITV use	A middle-aged black female with high school diploma without computer experience	"The WorldGate Internet has helped me very much. I now use a computer at work and I am thankful for experience I received by the Internet TV. It was great the city did this for us. I am seeing lots of adults feel like I do. Some of my friends use it all the time."
The socio-economically disadvantaged	• concrete benefits from LITV use	Quotes from council member Bobby Traylor	"Because of the use, because it has been able to bridge the digital divide, the elderly that's never seen a computer are now communicating with their children and grandchildren in cities in or out of state where the children and grandchildren live, and the grandchildren with a low-income, that probably would have never touched the computer until they reached the level in school to which computers were offered, whether they (were in) sixth grade. I don't know what particular grade that the computers are now being introduced into the school level. So, we're bringing all kids of low-income, middle-income ... out there that don't have access to a computer."

The socio-economically disadvantaged	<ul style="list-style-type: none"> everyone should use LITV 	A senior white male resident	<p>"The Internet TV is very important to me. I find it most useful and helpful. My wife and I are the only ones at this address. I am the only one who actively operates the equipment. However, it is not unusual for her to ask me to use the equipment for some purpose she has in mind, so both of us profit from it. I think the city did a great deed when they decided to furnish this service. And I hope they will continue to do so. I think the Internet is easy to use and I think everyone should use it. I intend to use it myself as long as I am able. I use it frequently.</p>
The socio-economically disadvantaged	<ul style="list-style-type: none"> everyone should use LITV 	<p>Quotes from council member Willie Edmonson who represented part of the African American community in LaGrange</p>	<p>"I would love to see everyone [use it], the children especially. They should have our children on it working on that thing constantly. Doing homework, emailing one another, asking one another about their homework, and things of that nature. I think, again I think that school systems, it should be some teacher in the classroom that should say, 'Look I'm going to take advantage of this because, each one of my students, I can email their parents. I can tell each one of my students that their homework assignment if they forget about it, it will be on the computer and it will be on the website whatever. I'll put it out there so you can find it'".</p>
The socio-economically advantaged	<ul style="list-style-type: none"> an inferior technology to me 	A senior male with college degree & PC experience	<p>"Without a printer, scanner or a CD drive, the WorldGate system is of no value to me."</p>
The socio-economically advantaged	<ul style="list-style-type: none"> an inferior technology to me 	A white male with annual household income > 75K	<p>"LITV is a 'Mickey Mouse' way to access the Internet."</p>
The socio-economically advantaged	<ul style="list-style-type: none"> an inferior technology to me 	A female with a doctoral degree and annual household > 100K	<p>"The problem is that web pages aren't designed to be rendered on a TV with its low resolution. Therefore graphics don't render well and too much horizontal and vertical scrolling is required to view a page. It's awful! I guess if you can't afford any other access, it's better than nothing. Otherwise, it's frankly pathetic."</p>
The socio-economically advantaged	<ul style="list-style-type: none"> an inferior technology to me good intention, bad execution 	A white female in her 30's with a postgraduate degree and annual income > 100K	<p>"I ultimately became frustrated when the service never seemed to work, and haven't bothered trying to see what's going on at this point because I use my computer ... Basically, I think the city's intentions are admirable, but the execution leaves a lot to be desired. Also, I have not had the sense that the service reached the people for whom it is intended – i.e., those who would go without service unless it is provided free. We never needed the service to have Internet access."</p>

The socio-economically advantaged	<ul style="list-style-type: none"> • an inferior technology to me 	A middle-aged white female from the wealthiest neighborhood in LaGrange.	<p>“I got the Internet TV to let my children experience the Internet because I was usually on my computer and they couldn’t use it. However, the Internet TV was a let down to the whole family, my 8 year old said it was too slow and links were not “found” many times. The transfer between TV and Internet was so frustrating to my 10 year old, he disconnected it one day and said he’d just wait to use the computer. I also found some pictures would not show on the Internet TV that did show on the computer and that was frustrating ... My opinion would be if it is really free, it may be good for people who can't afford a computer — but if they have ever used a computer for the Internet it may drive them crazy.”</p>
The socio-economically advantaged	<ul style="list-style-type: none"> • good intention, bad execution 	A white male in his 50's with a college degree and sufficient PC experience	<p>“This whole Internet TV was a show for the city of LaGrange and our mayor. It makes our town look good but in realty it was all a lot of BULLxxxx. I wonder who is looking [at] the bill.”</p>

* The socioeconomically disadvantaged and advantaged shared this attitude.