

Analysis of the Development of Kutztown Community Network

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Abstract

This study investigates the development, discourse, design, and social interactions within the Kutztown Community Network. Drawing on the theory of Social Construction of Technology, the study employs an in-depth case study approach to investigate how the community network was designed and how the Kutztown community participated in the network development. The findings show that there was little societal input into the design process; the design process was influenced by political economy factors, which now threaten the viability of the network. The study highlights the significant role of intermediation in developing community networks and concludes that community participation should not be limited to particular development stages.

1. Introduction

Community networks (CN) have been designed to provide local communities with free or low-cost electronic access to information content and a variety of electronic communication resources. CNs, as opposed to private networks, are designed for open and public access. Analysts have argued that, ideally, CNs should be designed, used, administered, and owned by the host community to help revitalize, strengthen, and expand existing social nets in the locality [1] [2]. Recently, as a result of the ever-increasing number of publicly funded projects, agencies and partnerships within the corporate sector, local authorities have been empowered to direct CN development. However, this power is highly mediated by other political factors outside the locality. The recent movement of a municipal-owned community network has been challenged by political wrangling and

economic limitations. The attention of policymakers of CNs is today focused on the question of how to promote competitive broadband markets that will deliver high-speed Internet access to a community at affordable rates. For this goal, the policymakers tend to implicitly rely on private enterprises to promote public interests. However, telcos and cable enterprises of the broadband industry have neglected to serve public interest and have opted to serve the most lucrative markets at the expense of publicly accessible universal services [3]. As a result, local governments and community groups across the country have started to build their own broadband networks, sometimes as a purely a public service and more often through public-private partnerships. The Kutztown telecom project is one such project, and the present case study evaluates the project drawing on a theoretical framework from the Social Construction of Technology of [4]. As [5] suggest, this study argues that the development of CNs should be heavily involved active and ongoing community participation, and its technologies should be (re)constructed through such social processes. Per this focus, this intensive case study seeks to better understand the promise and challenges of CNs, their development, design and configuration. In particular, we show how developers of the Kutztown CN (KCN) encouraged and fostered -- through planning, outreach, content, and design— participation by particular social groups and privileged certain forms of participation. We place the analytic focus on community itself instead of CN; that is, instead of asking what CNs can do for communities, we ask how communities design their CN and for what purposes.

Out research questions include: Who were the principal project partners and what were their respective roles and contributions? What were their initial goals and visions for the project? Were the goals and visions largely commercial or communitarian, or a combination of both? At what stage, if any, were community members invited to brainstorm, comment on, and contribute to the building of the network? What actions were taken to stimulate interest in and adoption of the network? What actions were taken to insure widespread and diverse access to the network?

The major findings can be briefly summarized. First, the KCN reveals the important role of participatory design in CN development. CNs as a public utility should draw on users' perspectives, its design should be heavily grounded in users' needs, and its design decisions should be based on community consensus [6]. While innovative in the approach to building their CN, the important design decisions in the Kutztown project were made by a small group of people, leaving the community residents (end-users), in general, out of the loop. A small group of technologists/political insiders/officials planned the project with limited input from other groups. Failure to engage public (end-users) and incumbents telco have resulted in problems for the project. Second, the project team's role as a leader, designer, and mediator was limited throughout the project, and the lack of participatory design led them to focus on the infrastructure while neglecting applications.

This study argues that input from citizens as lay designers provide an invaluable infusion of ideas into the development of effective CNs. A more inclusive process would have worked better for the KCN. Third, operational difficulties have surfaced in administering THE KCN? The KCN faces a critical financial dilemma, and its ongoing financial viability is in question. Threats to sustainability have stemmed from bleak financial projections, changing state and federal regulations, new technologies, and falling prices. Discussions

in the literature on the future models of CN is ongoing [7], this study concludes that CNs should not desert the obligation of public utility for the sake of financial viability.

2. Theoretical framework

Social Construction of Technology (SCOT) is an effective tool for the investigation of the technology developmental processes. SCOT is focused on analyzing the process by which a technological system develops, how this trajectory is maintained or reproduced, and how its character changes over time. SCOT allows analysts to trace the development of CNs both at the technological and social levels without distinguishing or categorizing between them.

The conceptual framework of SCOT consists of four related components. The first is interpretive flexibility (or strategy), which suggests that technology design is an open process that can produce different outcomes depending on the social circumstances of development. The second component is relevant social groups (RSGs) or stakeholders. RSGs are embodiments of particular interpretations. They are the actors whose actions manifest the meanings they attribute to artifacts. The third component is closure and stabilization. A multi-group design process can create controversies when different interpretations lead to conflicting images of an artifact. Design continues until such conflicts are resolved and the artifact no longer poses a problem to any relevant social group. The fourth component is technological frames or interaction among stakeholders. A technological frame is a shared interpretation of an artifact. According to Bijker³, the elements of technological frame include "all elements that influence the interactions within stakeholders and lead to the attribution of meanings to technical artifacts."

3. Data collection

The first author has been involved

informally and formally in an advisory role with the Kutztown network since its beginning. Because Kutztown is located within 10 miles of the first author's location, geographic proximity enabled easy data collection. Data were first collected in late 2004 and additional data from May 2005 to August 2005. A variety of methods were used, including in-depth face-to-face and telephone interviews with people associated directly with the project. In addition to interviews, WE analyzed archival project materials such as the project proposal; material prepared by project personnel on the technical and project management aspects of the project; material pertaining to the project generated by the KCN program committees, the telephone company, and others; and material pertaining to these projects generated by prospective users. Survey questionnaires were sent to obtain factual data such as regional information, demographics, and municipal information.

4. Case summary

The Borough of Kutztown, Pennsylvania is a rural area. With only about 5,000 residents living within its 16-square-mile territory, Kutztown was not what big businesses considered much of a market. There are approximately 13 thousand households with a density of 14 homes per square mile. Kutztown is governed by a representative town meeting and by a board of elected members. As the Borough of Kutztown and the Kutztown Municipal Authority looked into the digital future, they realized the need to expand current utility services to provide advanced voice, video and data services to residential and commercial citizens within their community. These services include traditional voice services and 10-100 Mbps Internet connectivity, with a goal to also provide advanced video and music offerings (including both video-on-demand and interactive television) and virtual private networking. New services such as

broadband community Intranet, automated meter reading and other energy management services are currently being prepared. Kutztown is served by Verizon (the local telephone company) and Cablevision (the local cable multiple service operator). Verizon provides voice service to Kutztown – however there were no DSL services till 2000.

As broadband technologies emerged in the late 1990s, the Kutztown municipality attempted to introduce broadband service in the area. However, cable and telecommunications companies were reluctant to offer broadband service to the Kutztown community. As community managers were concerned with the absence of broadband, they finally decided to offer it by themselves. In August 2002, Kutztown built its own fiber-optic network (cost \$60 million) for television, telephone and high-speed Internet service, the first in the municipality in the USA to do so. In offering service over infrastructure, the Borough sanctioned Hometown Utility, a locally based independent telephone company, to provide video and data services and voice services in partnership with Conestoga Enterprises, a locally based independent telephone company. Hometown's service offerings include telephone, Internet and cable services in competition with Verizon (voice and high-speed data) and Service Electric Cablevision (video and high-speed data). Service Electric has been a vigorous competitor and currently is offering prices for both cable TV and high-speed Internet below those that Hometown is offering.

Services over the infrastructure include one-stop shopping, utility payment and billing options, automated meter reading service and public works security monitoring. The Borough owns the infrastructure, operating under Hometown Utility, and provides video, voice and data service in partnerships with Internet and telephone providers. The Borough plans to offer future services including wireless Internet, video and music on-demand, home

shopping, televideo conferencing and home and distance learning applications.

5. Stakeholders and their strategies

By and large, four stakeholders were emerged around the Kutztown development: the Borough of Kutztown (the Kutztown Municipal Authority), technology vendors, the project team, and the community group. Each stakeholder had a different interpretation and motivation on the project.

-The Kutztown Municipal Authority: Cost-effective FTTH solution

The public groups eagerly wanted to implement a broadband infrastructure in the Kutztown community. The Director of Information Technology for the Borough of Kutztown said, "Part of our strategy in building a FTTH network is to construct a key physical asset that will be a source of continuous revenue generation." He continued, "This strategy will enable us to keep telecom revenues within the Borough as well as to control the rates that our citizens have to pay. Furthermore, we believe that the construction of a cost-effective, but highly-reliable FTTH network will improve the Borough's credit rating and ability to borrow money for future projects." Much of the municipality's goal was to boost economy in the region through a technology infrastructure.

These groups, however, were rarely involved in the actual planning, designing or implementation of the FTTH project. They were looking for a private company to provide a turn-key system instead of a customizing system. In general, they had a limited understanding of the financial and technical aspects of the project, despite considerable time spent for the preparation by the Borough staff. In addition, there was a conflict between strategic level and operational staff. The staff of operational level believed, "the mayor has done everything in his power to disrupt the operations of the Borough of Kutztown." They further expressed, "He has cost the

Borough thousands of dollars in legal fees and incalculable amount of frustration, delay and waste. He has publicly and aggressively disagreed with every member of current and past Councils, three different attorneys from the Borough Solicitor's firm, the Borough's bond Counsel, Borough Special Counsel, the Borough's independent auditor, the past Borough Manager and numerous current employees."

-The Atlantic Engineering Group: Expanding business opportunity; Corning Cable Systems: Upgrading their infrastructure

At the time of the project, the Atlantic Group was a relatively newly start-up company. The company wanted to leverage its experience and expertise in the telecom industry through the Kutztown project. The project team selected the Atlantic Engineering Group because they were specializing in FTTH and end-to-end solution. Per the project team's request, the Atlantic Engineering Group offer the Borough the turn-key basis it was looking for — combining FTTH electronics from Optical Solutions with all of the outside plant infrastructure. The Atlantic company wanted to work with Corning Cable who would provide a favorable rate for infrastructure. As a subsidiary company of Atlantic Engineering Group, Corning Cable Systems was selected to provide the Borough of Kutztown with a complete passive infrastructure solution for their FTTH deployment, including optical cable, splice closures and couplers and splitters.

-Hometown Utility (project team): Municipally-owned utility

As the Kutztown Municipality decided to build its own network, they created a project team, which was composed of project manger from the Municipality, technicians hired from a local tech firm to lay a fiber-optic ring, project managers, staff from the Municipality, and staff from Verizon and cable companies. The project

team later became a municipally owned power utility, Hometown Utility, which serves the Borough of Kutztown.

-Local telco (Verizon) and cable operators (Cablevision): Market competition

Verizon and Cablevision had refused to provide the town with broadband services due to economic reasons. The area is rural area with low population and providing services did not make sense in terms of return on investment. In the beginning of the project, Verizon showed no interest in the FTTH deployment— they thought it was too small to feel threatened or even plan a response. Cablevision even tried to frustrate the project by launching a huge press campaign against the deployment saying that it was an untried technology and a waste of taxpayer’s money. Also, they said that the project team had no experience in the telecom business and hence this would be a non-starter. Then, Verizon took the side of Cablevision, opposing the plan because they worried about losing potential customers and revenue. They argued that they could not compete with local governments, which can subsidize their network construction with tax funds then offer the Internet service at below-market prices. After the project team started providing service, Cablevision reduced the price of its extended basic package from \$36 to \$25 per month. The project team contacted both telco and cable to get them to switch over to the FTTH network; both declined as they wanted to own their customers.

-Community groups: Broadband services

Community groups, which were the subscribers in Kutztown, generally wanted advanced voice, video and data services for residential and commercial citizens. These services included traditional voice services and 10-100 Mbps Internet connectivity, with a goal to also provide state-of-the-art video and music offerings (including both video-on-demand and interactive television) and virtual private networking. They were less

interested in the services by the municipality such as broadband community intranet, automated meter reading and other energy management services. Affordable broadband connectivity was not provided up until the end of the project, which was the most needed and wanted service.

6. Intermediary roles of the project team

As the project rolled out, the project team was formed comprised of the representatives from each stakeholder. The project team played substantial roles along the process of the network development including design, development, implementation, and maintenance. What is most notable from their roles was interaction with different stakeholders over the network development. The project team’s interactions with the subscriber groups began with identifying their key problems, problem-solving strategies, and requirements for implementation of the subscriber sites. Through the needs analysis from mail survey and informal inquiry, the project team identified that the most needed services centered on affordable broadband services. Additional prospective services were identified from the strategic level of the municipality: supervisory control and data acquisition/automated meter reading and automated meter reading. The project’s main concern regarding the network was to provide the public services (supervisory control and data acquisition/automated meter reading) and further provide advanced broadband services such as healthcare and distance education services to the areas.

Through the needs analyses, the project team identified *key problems* in providing services: the area generally lacked technical and financial resources. For this problem, the project team came up with *problem-solving strategies*; the team believed that public (tax and bonds) fund could be used to build broadband infrastructure. In addition, the team recognized three *requirements* for the project to be viable: (1) advanced public services to be provided over the network, (2) a large amount of participation, and (3)

affordable and backward-compatible technology. The project manager said, "The criteria were that we integrate several services into one network, and provide connectivity to a large number of partners. The services provided had to be affordable and amenable with what they had." After identifying their key problems in 2000, the project team issued Request for Proposal (as required by law) and invited vendors, builders, contractors, and service providers to participate in this project.

To achieve these requirements, however, there were two problems in the planning of the project: (1) lack of consensus among stakeholders, and (2) absence of a viable financial solution. As for the lack of consensus, the different stakeholders had slightly or totally different interpretations on the project and thus there were low levels of cooperation among the stakeholders. Kutztown's original plan focused on building a distributed system whereby private enterprise could provide their advanced services without a significant financial investment on new infrastructure. However, Verizon and Cablevision would not cooperate for this plan as they did not favor the concept of not owning the infrastructure to the subscribers' homes. They wanted to own the infrastructure so that they could make more profit by enforcing proprietary standards. Thus, in general they were not in a favorable stance toward the initial plan. One staff member from Verizon expressed, "The Kutztown Municipality is a technology maverick." A respondent from Cablevision also added, "Any municipal project undermines the market." The plan, however, was welcomed by independent ISPs and CLEC (Competitive Local Exchange Carrier) as they were not afforded to invest in expensive infrastructure.

Under the project team's leadership and coordination, numerous meetings and information sessions were held and finally a consensus came out to make a go of it. Among technology alternatives (ISDN, xDSL, FTTC), the Borough of Kutztown decided that FTTH was the best

infrastructure solution to meet the needs of their community, both present and future. Kutztown financed the FTTH infrastructure through taxable bonds. In assessing alternative technologies that could leverage traditional copper infrastructure, the Borough concluded that copper-based solutions were not in the best position to meet the demands of current services and that a copper-based approach would ultimately restrict future network upgradeability and scalability for its citizens. Copper-based solutions would also constrain the Borough's ability to deliver enhanced community services. Furthermore, Kutztown concluded that a FTTH solution would complement its existing municipal-owned electric system, enabling the Borough to make use of its utility pole ownership, right-of-way assignments and construction equipment, as well as its technically competent field staff for construction, service and maintenance, and its office staff for customer, marketing and billing services.

Then, the next question was how to procure FTTH infrastructure. The project team proposed to use public funds in order to buy FTTH infrastructure and there were pros and cons to this novel proposal. The pros' group argued for funding the project with taxable bonds to create private enterprise business alliances. Interestingly, Verizon and Cable were on this side because they could bypass their obligation to build infrastructure. The opposing group, however, counter argued that the public money should not and cannot be spent for uncertain projects with assurance of return on investment. In addition, some local technology vendors objected to the idea of municipal broadband and argued that governments monopolizing broadband or discriminating against competing private networks would discourage private companies to deploy and invest in competitive systems.

While the debate was vigorous and robust, the pros' idea prevailed because allies of the Borough of Kutztown and telco supported and approved the plan and there was no other feasible alternative solution to

bring FTTH down except for the public funds. The Kutztown municipality had the project team host several demonstrations (test-beds) and trials of what broadband services could offer over FTTH infrastructure. Through the demonstrations and trials organized by the project team, the con's group acquired a sense of the advanced broadband services and capabilities that the Kutztown network would promise. These groups' technological frames were outlined and fleshed out by the project team's trials and demonstrations of the network's advanced applications capabilities. In other words, people's technological frames emerged from "the" obscurity level to reality, and the project team made the plan operationally feasible.

7. Stabilization of the network

It appears the Kutztown network is being stabilized as an ideal municipal network providing the community with broadband services. In the summer of 2002, the project team established themselves as Hometown Utility, the Borough-owned utility, which was offering cheap, high-speed Internet access to any home or businesses within the town's boundaries. Funding for the project has primarily come from three sources: (1) originally, funding was through a 30 year taxable bond issue for \$2.1 million, (2) the Electric Reserve Fund contributed \$1.7 million, and (3) the current operating revenues. The network has 821 subscribers, and 120 are college students.

Looking at the downside of it, however, the project has faced two operational obstacles that seriously threaten its viability: financial constraint and a legal block caused by conflict with the incumbent service providers. In the beginning of the project, Verizon and Cablevision in Kutztown, did not favor the idea that Kutztown would have municipally owned Hometown Utility leaving them out of the loop. These companies warned that Kutztown could not cover costs without being subsidized. These concerns turned out to be a reality. The

subsidies are approximately estimated to range from \$350 to over \$1,000 per customer, excluding any capital costs. These subsidies are covered primarily by the surpluses of the municipally owned electric (and other) utilities. Without these subsidies, electric rates could be lowered, or the utility could contribute to the operating costs of the municipality, which would lower taxes. There seems to be very little prospect that Kutztown can pay off its initial investment. Opposing voices have been raised that the telecommunications venture will be the biggest drain on the Borough's taxpayers. It becomes increasingly difficult for Kutztown to attain the combination of market penetration and price level necessary to make their investment pay. Besides financial problems, Kutztown municipality is dealing with regulatory obstacles that have been passed to protect private enterprise and limit the municipality's participation in the local telecom market. There has been an increasing pressure and opposition of state and local governments entering the local private telecommunications market.

With these difficulties, the Kutztown network has started to turn its direction towards a private network. Although the Kutztown network started from a community network (or public network), it is being closed and stabilized as a private network. The initial plan was to build the FTTH infrastructure and then lease parts of the system to private service providers to offer content to the customers. This plan turned out to be ineffective. The Borough built the infrastructure in lieu of private companies who then took advantage of the established infrastructure by offering services over the infrastructure. Telco and cable refused to build infrastructure, yet they had a plan to deliver services, and they preserve the opportunity to enter such area until the area becomes cost-effective. Now, as the network faces the financial constraint, the project team has considered negotiating with Verizon to transfer its ownership in a discount cost (this was what Verizon had in mind at the beginning of the project). Financial difficulty, political wrangling, and

regulatory setback have sped up the privatization process. Most importantly, the community's decreasing support has been the significant catalytic factor in stabilizing the project as a private network. The community residents, who used to be strong supporters, now have turned to strong opposition. They commonly indicated that Kutztown broadband has attracted business, but the Borough spent too much public money on the network. The decreasing support from the community is critical because the funding comes directly from their tax money. As the Kutztown network is now losing its momentum as a CN, a question was raised that the Kutztown project is "Failed Municipal Fiber Networks" as Robert¹² puts it: started with a spirit of public initiative but returned to private network wasting public resources.

8. Conclusion

There was an underlying assumption over the development of Kutztown: the community was passive users' group and the community was neither an active participant nor proactive developer. While this study started with the assumption of community as an active designer, this study ended up with realistic finding that the community was an onlooker and the community rarely has opportunity to participate. Most interactions within the CN occurred within each group boundaries: Communication between groups was not as active as it could have been. Most cross group communications occurred through mediation by the project team whose members are composed of diverse groups. The role of the project team was supposed to facilitate communications among the groups. However, it turned out that the team were unable to fulfill their roles and community communication and activities for the CN design suffered, which explains why, one of the first questions put to the project team by our community partners was whether 'CN could assist in building and strengthening communication links in the community?' As Day and Schuler⁸ indicate, this is not just a

technological question. It has significant community development implications and this should have done and could have been resolved early in the project to work with local agencies and organizations to support their work in addressing this and other community identified communication problems.

Apparently, the development of the Kutztown broadband network can be seen as an innovative endeavor building a municipally owned broadband network, and it also can be regarded as successful in part because the municipality has operated the network and provided the town with broadband services.⁶ However, important questions can be asked here: with what roles did the community participate in the development? Why has the applications that were initially planned not been introduced? Without actual applications and services, how can the project are referred to as CN? These questions become increasingly important as the network becomes stabilized as a private broadband access provider. Currently, the Kutztown network offers broadband access to residents with a relatively affordable rate which was unavailable before the network. Recently, private vendors are about to provide the broadband access with a cheaper rate. Then, what is the rational for having a municipally owned network costing public funds? How will the Kutztown municipality compete against aggressive private vendors? These questions relate to the ontological obligation of the Kutztown network, which has been designated from its beginning because it started with the key notion "by the community, for the community, and of the community." Without providing substantial benefits to the community, the Kutztown network will be privatized finally due to financial difficulty and regulatory holdup.

Their developmental process reveals that the project team's intermediary role was effective in part, but was not diverse enough to include the community groups. Lack of participatory design led them to only focus on the FTTH infrastructure. A list of applications was not based on the

community's need; instead, it was simply proposed by the upper municipality as a perfunctory process. As a result, none of the proposed applications have been realized so far except for the broadband access. Even the broadband access becomes jeopardized by private vendors who are willingly providing cheaper and faster broadband access. Therefore, in order to remain a sustainable and municipally operated network, that is, a genuine CNs, the Kutztown network should focus on public applications that can produce public benefits such as telemedicine, distance learning, and e-government. In the absence of such services, the network will not be different from private networks. The Kutztown network is suggested to find a way to realize community application over the infrastructure. In developing future CNs, a community should be fully informed of processes and decisions [8]. Further, community participation should be involved in all the processes of community network development: system investigation, analysis, design, and implementation [9]. This is a key idea of social construction of technology that needs to be further developed in the context of community by future studies [10].

As a practical suggestion, this study concludes that a municipal-owned community network is unfeasible economically unless state or national level of support is provided. Although the idea is ideal and optimistic, the reality is disappointing and difficult to realize. In order to be economically feasible, a higher government agency should own and supervise CNs while local communities should operate CNs in places that are unable to attract private providers. Just like the National Information Infrastructure initiative, a national level of support should be provisioned to keep CNs in our society. In this light, many researchers stand in opposing view on municipal owned community networks, arguing that municipal ownership of broadband networks is probably not in the best interests of residents and most businesses even in communities not well served by private

companies. While the financial viability of community network has challenged the network operation, it should not challenge the value of CN itself.

9. References

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