

Introduction: Co-productions of Social and Technical Change

In the middle of the 1920s, as Europe recovered from the First World War, industrial production turned from military production to consumer goods. In an era of relative plenitude and massive technological innovation, avant-garde artists like the Futurists envisioned new social forms evolving along with technologies of scale and power never before imagined – wireless radio transmission, airplanes, factory floors, electrical stations. The Futurists wrote poetry about robots and manifestos inspired by car crashes. If mechanics and technics were going to change warfare and transportation, they were also going to change how to write, make art, and think. The Futurists, especially the Italian Futurists, created new ways of visualizing words and used wireless radio to transcend the oppression of fixing words in space and time. Technology implied speed, danger, and risk (Kahn 1992) and Futurist poetry combined brevity with strong images to channel this energy (Martin 1978). Futurism also created new ways of making art and doing activism, and eventually contributed to political movements that emphasized radical change, and a new kind of worldⁱ that could be liberated from the past just as technology like radio was liberated sound from space.

In this thesis I describe how the products of innovation are simultaneously social, technical, and political. Like the Futurist art that was inspired by technology and in turn created new ways of thinking about modernity, contemporary explorations in developing WiFiⁱⁱ technology for communities create new forms of social and political engagement – and impact the development of communication institutions

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University

and policies. I describe how groups of people working outside corporate and commercial structures influence not only the material forms of this new communication technology, but also the social organization and policy landscape that surrounds these forms. I argue that social and technical forms are co-produced, and further, that alternative, critical forms of technology, organization, and policy can arise together from phenomena like community WiFi. Developing at a critical juncture in the political economy of communication in North America, these new critical forms have a range of potential consequences extending from creating local communications infrastructures and mobilizing local citizens in new forms of knowledge exchange to influencing policy discourses at the national level in North America.

Three overarching questions guide this thesis' examination of the North American community WiFi phenomenon. How do community WiFi projects leverage the progressive visions of ICT technology to create new technologies and organizations that are appropriate for their local areas? To what extent do these projects contribute to a democratization of communication? How do discourses and practices associated with these non-commercial WiFi experiments bridge between technically-competent “geeks,” policy advocates, and local government officials? In addition, the thesis argues that situated, participatory research is a productive way to investigate and assess the social and political outcomes of socio-technical phenomena like community WiFi.

The thesis presents case studies of two community WiFi projects in North America, along with an historical study of previous “computerization movements” that

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University

illuminate how these self-organized, non-commercial groups advance progressive visions for computing and information technology. The framework of “computerization movements” conceptualizes how activists, hackers, geeks, municipal government officials, and public interest lobbyists influence the contemporary communications landscape by developing local WiFi networks, establishing discourses that align WiFi networking with innovation, and developing knowledge sharing practices. The thesis documents the shifts as these discourses, practices, and innovations move from being alternative, oppositional and critical, to creating new institutions. In particular, it tracks the shift from local WiFi projects involving small groups of volunteers to larger-scale municipal WiFi connectivity projects, noting that both of these projects use the symbolic connection between WiFi and innovation to brand their communities. At the same time, knowledge sharing between WiFi geeks and media reform advocates introduces new stakeholders and strategies to policy processes. As Mueller (2002) notes, processes of experimentation outside of large institutional structures influence the development of institutions that govern technical systems: “there is a life cycle in the evolution of technical systems. Systems that create new resources and new arenas of economic and social activity can escape institutional regimes and create moments of disequilibrating freedom and social innovation. But eventually a new equilibrium is established.” (p. 266).

Experiments in technical innovation can establish ideological links between technological changes and increased justice and freedom. In 1970, Carey and Quirk (reprinted in Carey, 1989) wrote, “an increasingly prevalent and popular brand of the futurist ethos is one that identifies electricity and electrical power, electronics and cybernetics, computers and information with a new birth of community,

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University

decentralization, ecological balance, and social harmony” (Carey, 1989 p. 114).

Community WiFi is the latest in a series of social mobilizations of technologies that express this ethos. These are “computerization movements” where non-commercial actors develop and promote computer technology. Often, computerization movements connect technical innovation with political or social goals: for example, in the 1970s personal computers were connected with the California counterculture and its goal of developing communitarian self-sufficiency. The concept of re-mediations explains how mobilizations like computerization movements transform society and technology. Developed by Touraine (1988) and refined by Lievrouw (2007), re-mediation describes how elements of media and technology that belong to one period of time or social order can be taken up and transformed by contemporary critics of that social order. This has occurred, I argue, in previous computerization movements and it is now occurring with community WiFi – with some important consequences for the development of WiFi technology, telecommunications and media policy.

In this context, the study of the community WiFi movement is timely and important since it reiterates that technology and policy are not exclusively developed from the top down. Social movement theory has noted how the grassroots – self-organized social and political participation inspired by community interest – influences political change by involving a greater number of people in social movements (Langman 2005). The outcomes of community WiFi projects demonstrate that a similar process occurs in technology projects, and suggests that this process may also have political influence. Local WiFi projects are often begun as solutions to local problems, but they introduce their participants to the political potential of local networking

Co-productions of Culture, Technology and Policy in the North American
Community Wireless Networking Movement – Alison Powell, PhD, Concordia
University

technology and to broader organizations that in turn influence larger institutional structures. This thesis argues that grassroots actors in the technology realm influence the organization and significance of computing, communication, and public policy. WiFi communities and WiFi publics can contribute to the development of emerging technologies, but also their politics, their governance, and their symbolic importance – sustaining the public interest.

Research Sites

This thesis focuses on community wireless networking (CWN) in North America as it developed between 2004 and 2007. Case studies of two local CWN projects in Canada are detailed: Montreal's Île Sans Fil and Fredericton, New Brunswick's FreeZone. These local case studies are integrated into a discussion of a broader North American CWN "movement" that has created a more politicized identity for WiFi networking, embedding it into broader movements for media reform concerned with equitable access to communications media and an expansion of local and community media. The politicization of WiFi draws on its symbolic value as a new, flexible innovation developed from the "bottom up" – that is, by tinkerers, amateurs and volunteers rather than in corporate research and development departments. This provides WiFi with an amateur cachet that, combined with the fact that it is inexpensive and flexible, helps to establish its somewhat oppositional socio-political context. For example, in each of the case studies, WiFi technology stabilizes into technical structures that are appropriate for the places where they are built. Local CWN projects create different contexts for "community" and "public" media and information technology, including expanded opportunities for civic participation and social capital development, novel institutional frameworks for managing

Co-productions of Culture, Technology and Policy in the North American
Community Wireless Networking Movement – Alison Powell, PhD, Concordia
University

communication as a public service, and configurations of WiFi as a media distribution channel. When these local projects are linked together in a more global “movement,” tensions are produced between opposing understandings of WiFi’s potential political significance, characterized by attention to features and possibilities of the technology. These tensions, like those in previous computerization movements, produce a productive dialectic. The outcomes of this dialectic in turn influence discourses of “community” and “public” media and information technologies, as well as practices like “policy hacking” that attempt to influence the broader political-economic structures governing the adoption and use of media and communication technologies.

Like other computerization movements, community WiFi is a product of its time: it draws on the technical possibilities and social organization of the early 2000s. Three contextual elements are particularly important: first, tinkering and hacking WiFi technology occurs in the context of a worldwide shift towards distributed software production as part of the free and open source software production movement. Second, local WiFi projects return control over communications technology to the local “community” scale in a contemporary context of ubiquitous, global connectivity. Third, WiFi networks permit new ways of thinking about media publics – both mutable and mobile publics that can form around media delivered via WiFi as well as a broader public interest that can be served by progressive policy making at a critical juncture in media and communications. McChesney (2007) describes the current North American media and communications landscape as being at a critical juncture produced by a lack of confidence in existing media sources, a volatile political situation marked by widespread criticism of government, and new technological developments that promise alternative means of creating media, as well

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University
as by neoliberal governance structures characterized by deregulation and erosion of public service models for communication media. These three elements of context appear throughout the thesis, which contains six core chapters.

Outline of the Thesis

Chapter One situates the thesis as an application of science and technology studies (STS) methodologies within communication studies. It argues that throughout the entire process of development, institutionalization, and use of communication technologies, social and technical forms are co-produced. It also describes the participatory, qualitative research approach used to investigate this process in the case of community WiFi, which I believe is particularly appropriate for investigating these new socio-technical phenomena. In this chapter, I define some of the social categories I use to describe groups of people brought together, inspired, or mobilized by different aspects of the community WiFi phenomenon. In particular, I define WiFi “communities” and “publics” as two types of social categories leveraged by community WiFi, further arguing that “publics” are more politicized than “communities.”

In Chapter Two I describe how computerization movements from the 1970s onwards create alternative political frameworks for computerization technology. I draw on Kling and Iacono’s (1995) understanding of computerization movements as being actions by actors to promote computerization, using the rhetorical form of technological utopianism. I then argue that computerization movements operate around a dialectic between criticism of the dominant structures of computerization and the development of alternatives to them. Chapters Three and Four are local case

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University

studies of community WiFi projects – Chapter Three describes the role of “geeks” in developing a cultural and social identity for community WiFi in Montreal, and Chapter Four assesses one of the first municipal government efforts at building a community-wide WiFi network, the Fred-eZone in Fredericton, NB. After these local case studies, Chapters Five and Six take a broader perspective. In Chapter Five I describe the efforts at constituting a North American “Community Wireless Networking Movement,” analyzing how different movement actors create different kinds of symbolic linkages between technology and politics, and how these differences are resolved through the creation of a common discourse, practice, and progressive political orientation. Chapter Six describes “policy hacking” as bridging the Community Wireless Networking Movement and a much broader media reform mobilization in the U.S. (and to a lesser extent in Canada). The thesis concludes with a reflection on the outcomes of the community WiFi phenomenon on WiFi technology, communication policy, and knowledge sharing among activists and scholars in communication studies.

Contribution to Communication Studies

My approach to studying community WiFi positions it as a destabilizing, emerging technology that is co-produced along with novel social forms, some of which aim to criticize or destabilize the institutions involved in technology production and regulation. Over time, the outcomes of this co-production influence the material form and symbolic importance of WiFi networks in local areas, as well as, potentially, communication policies. This thesis contributes to a growing body of constructivist analysis within communication studies that consider the co-production of symbolic, cultural, and technical aspects of communication technology. In addition to conceptual work conducted by Boczkowski and Lievrouw (2007), Bowker and Star

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University

(1999), and Dutton (1996; 2006), empirical work includes Douglas' (1987)

investigation of the cultural, policy and technical impacts of amateur radio operation in the 1920s, Haring's (2006) study of ham radio operators, and Laegran's (2002) study of the intersection between Internet and automobile technology. The work in this thesis also draws from previous studies of WiFi as a technical innovation and a growing industry (Bar and Galperin 2004b, 2005, 2004a; Sirbu, Lehr, and Gillett 2006), and as part of a set of resistant or countercultural social practices (Sandvig 2004). From a cultural and critical theoretical perspective, Mackenzie considers the cultural significance of a technically unstable and "kludgy" technology being used to define public space (2003) or as a form of resistance (2005). More recently, a much broader critical literature describing new applications for local development of WiFi and other wireless technologies (Fuentes-Bautista and Inagaki 2006; Powell and Shade 2006; Tapia, Maitland, and Stone 2006) their policy implications (Lehr, Sirbu, and Gillett 2006; Osori 2006) and their social and cultural impact (Cho 2006; Middleton 2003; Powell 2006) has emerged in the scholarly arena.

Modifying WiFi hardware and software began as what Haring (2006) calls a technical hobby: a "productive recreation [that] must require some technical understanding or skill beyond simply how to operate a technology" (p. 2). Haring describes amateur photography, recreational computer programming, and ham radio as examples of technical hobbies. She also argues that technical hobbyists represent aspects of their personality with respect to the technology, creating a technical culture that establishes what a technology is and how it is to be used. As I explore, "WiFi hackers" and "WiFi geeks" also develop their own technological identity, in turn defining a social and political role for WiFi.

Of course, the technical culture of WiFi has not been confined to groups of geeks, and the thesis also explores how the politicization of WiFi has moved into other spheres, including municipal governments and nascent social movements including media reform. This politicization of WiFi technology occurs at the same time as an expansion of the commercial WiFi industry, and its eventual contraction. In the final chapters and conclusion, I place the overall development of community WiFi technology, organization, and policy contributions in context with the municipal WiFi networking boom – and eventual bust.

The Importance of Material Structures

One of the central assumptions in this thesis is that technical and social structures grow in concert with one another. This suggests that the material forms of technologies are not neutral and are instead part of the cultural and technological forms that are co-produced. Some previous work, most notably Galloway (2004) has already assessed the cultural and social implications of communication technology's material forms. For example, Galloway (2004) conceptualizes technologies in terms of their ability to provide means of control. He argues that protocol, or the regulation of access to distributed information networks, is one of the most powerful forms of control that contemporary postmodern societies can produce. Galloway's insight suggests that analysis of material communication structures is also a study of social shifts. Therefore, before continuing with the rest of the thesis, I present a brief discussion of some of the dominant forms and structures – wired and wireless -- common in North America. These forms, and the way they have been framed as significant within various social and political formations, are discussed throughout the chapters that follow.

Wired Network

Wired networks require each individual subscriber to have a connection to the main line. Wired networks include telephone, DSL and ADSL internet services, cable television, and electrical systems.

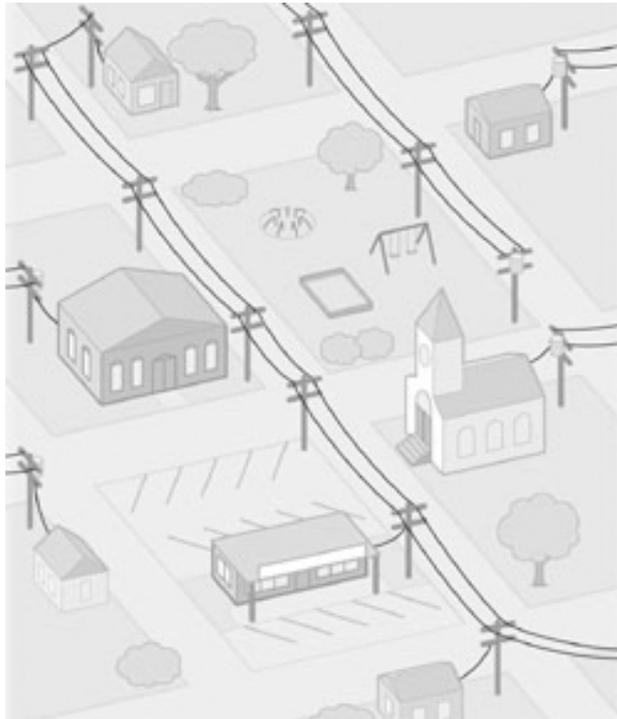


Figure 1: Wired Network

(All network schematic images courtesy of CuWiN and created by Darrin Drda)

Wireless Networks

There are three general types of wireless or WiFi networks: hotspots (also known as wireless access points), hub and spoke networks (also called point-to-multipoint), and meshed networks, which are either static or dynamic.

Hotspots

Co-productions of Culture, Technology and Policy in the North American Community Wireless Networking Movement – Alison Powell, PhD, Concordia University

Hotspots are locations at which signals are broadcast wirelessly to the immediate geographical area. If internet connectivity is required, a backhaul link must be made to a source of internet bandwidth. The Île Sans Fil project is based on creating a large number of hotspots, each of which is connected to its own source of bandwidth.



Figure 2: Hotspots

Hub and Spoke Networks

Hub and Spoke networks use a broadcast model to broadcast signals. Hub and spoke systems are often used in fixed wireless installations where wireless is used to disseminate a signal in areas where fiber-optic cable cannot be laid due to geographic or economic limitations. The Fred-eZone network primarily uses hub and spoke architecture.

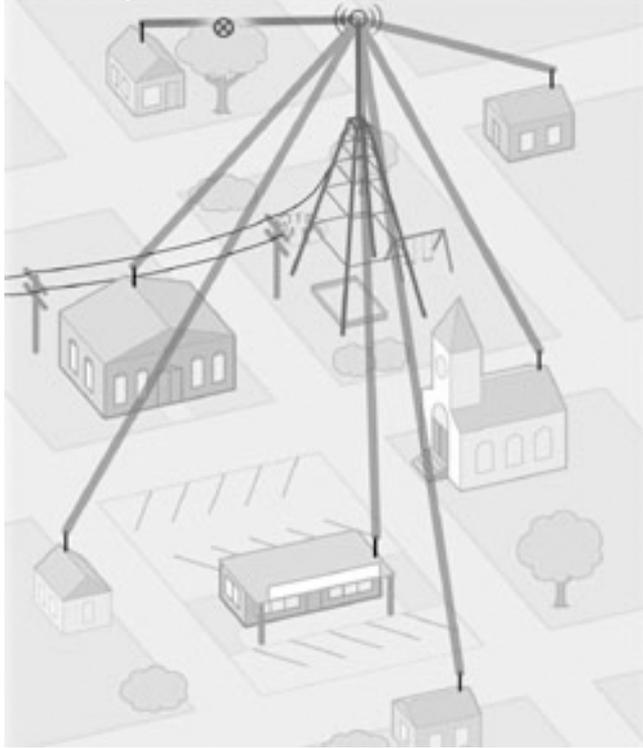


Figure 3: Hub and spoke Network

Static Mesh Networks

In a mesh network, wireless network nodes both send and receive information, making it possible to share one internet connection among a large number of locations that are not necessarily in proximity to a tower. Mesh networks also have multiple points of failure, unlike centralized networks. There are two types of mesh networks: static mesh networks and dynamic mesh networks. Connections over a static mesh network can be interrupted by interference to the radio transmission. The Fred-eZone network uses some portions of static mesh.

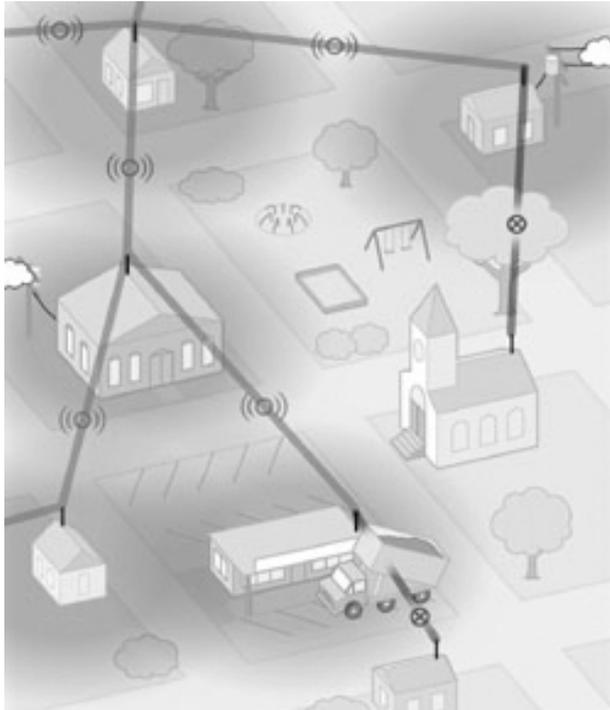


Figure 4: Static Mesh Network

Dynamic Mesh Networks

Dynamic mesh networks not only use nodes to both send and receive network traffic, they also route around any potential damage to network. Therefore, if one node is broken or not operating, network traffic will move to the destination using other nodes. Dynamic routing is also used to send packets over the wired internet.

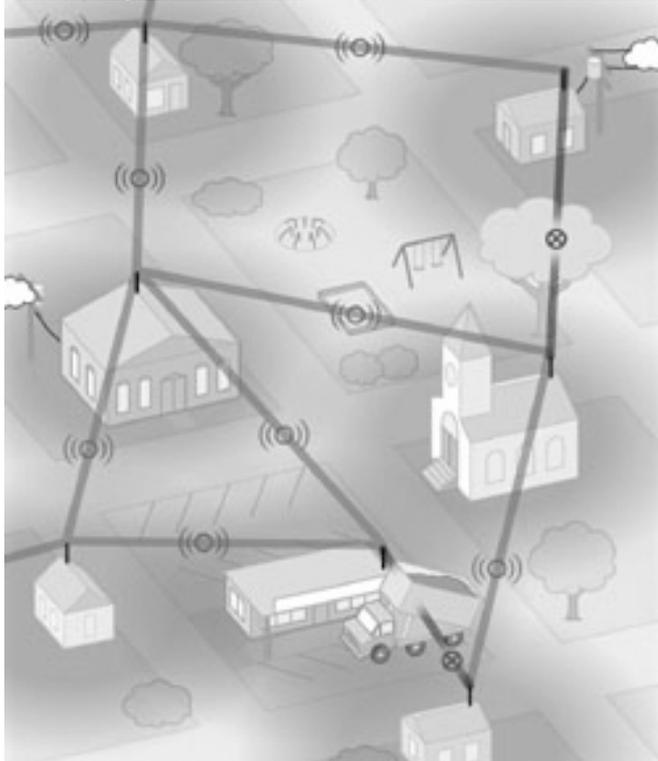


Figure 5: Dynamic Mesh network

Conclusion

The grassroots experimentation, municipal institutionalization and eventual politicization of community WiFi demonstrates how technical and social change occur together, and how dominant structures are influenced by the discourses and practices of those on the margins. Like the avant-garde of the early 20th century, the various players in community WiFi (hackers, geeks, bureaucrats, policy wonks, academics, people with laptops, or members of communities without internet connectivity) have a new set of tools, terminologies, and structures that they use to re-envision their world. This thesis presents the analysis of a process of technical, social, and policy change connected with community WiFi, arguing that symbolic, material, and organizational elements are all co-produced. It reframes community networking as democratic communication, assessing the potential of community WiFi

Co-productions of Culture, Technology and Policy in the North American
Community Wireless Networking Movement – Alison Powell, PhD, Concordia
University

projects to democratize communications, and to communications policy scholarship

by revealing how discourses and practices from critical computerization movements

can bridge into policy-making spheres. The next chapter begins by defining co-

production in a communication studies context, proposing that situated, participatory

research is an innovative means to explore the co-production process.