Chapter One: Co-production of Communication Technology and Society -- Key Concepts and Methods

Introduction

In keeping with Winner's assertion that "technology brings forth a world" (Winner 1993), I argue that new technical innovations are inspired by the cultures in which they develop, as well as contributing to how particular cultures consider the role of technology. New innovations rarely come out of nowhere – they are made in local cultures and are part of the evolution of these cultures, with all of the social and political complexity that this implies. In the following chapters I argue that different social contexts for the development of technologies bring forth different worlds, some of which challenge the existing politics of technologies or the social organizations in which they are established. I examine non-commercial development of technology, especially technology developed by amateur groups and municipal governments. I claim that these contexts are "alternative" to commercial research and development processes, particularly because they involve experimentation directed at solving local problems or are of interest to the developers rather than directed towards refining a product for sale. I argue that these alternative contexts for ICT development provide unique cultural and social contexts for both the development and use of these technologies that are perceived as augmenting the democratic impact of ICT development and use. Community WiFi is the latest in a series of "computerization movements" that connect progressive social and political visions with advances in ICT. In the following chapter I analyze how "computerization movements" form the historical context for community WiFi, and then

I present case studies focusing on different aspects of the co-production of WiFi technology, social organization, and policy in Chapters Three through Six. This chapter establishes the analytical background for these central questions, comprising four sections of increasing specificity.

I argue that the community WiFi phenomenon is socio-technical: its social and technical aspects are inextricably intertwined and mutually influence one another. In the first section of the chapter, I situate the analytic context for this claim by discussing how the social aspects of science and technology have been conceptualized through the social studies of science and technology (STS), particularly though its social constructivist tradition. After an historical review of trends within STS, I introduce contemporary perspectives on the co-production of technology and society. In the second section, I consider how co-production is applied in communication studies. I discuss three conceptual approaches that are particularly applicable to the example of community WiFi: 1) discourses of expertise, 2) articulations between technology and society, and 3) the role of network forums as sites of technical and discursive exchange. The third section of the chapter more specifically discusses the social forms produced in relation to ICTs, distinguishing communities from publics, arguing that both of these social forms emerge in the context of community WiFi, and that both are politicized. In the final section, I argue that the best way to approach the socio-technical phenomenon of community WiFi is to engage in situated research that constructs analytical frameworks iteratively and that draws on observation of and participation in the processes it describes. Some of the features of situated research include relationships with research partners and

an understanding that every researcher participates in constructing the reality and importance of their research. I therefore review ethnographic and multi-sited methods as they have been adopted in STS, communication studies, and community networking, and reflect on the appropriateness (as well of the challenges) of using participatory, multi-sited methods in this thesis.

Social Research on Science and Technology

Thirty Years of Science and Technology Studies

Science and Technology studies emerged from the social studies of science, whose goals were to draw attention to the role of culture and social experiences in the development of "objective" science (Pinch and Bijker 1992). The sociology of science formed part of an overall movement in the social sciences that challenged positivist assumptions that categories such as race, gender, mental illness – or even scientific fact – were fixed and determined. By studying the social worlds of scientists in laboratories, social science of technology (SST) opened a formerly black-boxed world and explored how work practices and cultures influenced the creation of 'objective' science.

In the 1970s this approach was extended to the study of technology development, and science and technology studies (STS) have since continued to develop strategies to explore the social and cultural processes that shape the development and appropriation of technologies. Wacjman (2002) describes STS as a way of transcending the debates over the division or alignment of nature and society[i] and countering the determinist view that technology is autonomous and therefore separate from the social realm. She claims that

STS "rejects the notion that technology is simply the product of rational technical imperatives . . .[therefore,] technology is a socio-technical product" (p. 351).

Early STS research considered that social factors had a determining influence on the development of technology. The social construction of technology (SCOT) perspective popularized in the 1970s and 1980s concentrated entirely on the social impact of relevant social groups (or actors): the people and groups involved in designing new technologies and in defining who might use them. One sub-set of SCOT is the socio-technical study of systems development. In this tradition, political forces are analyzed as having a determining impact on the eventual shape of systems. Examining the political impact of technology from a different perspective, constructivist studies of gender and technology consider the political consequences of technology's gendered qualities. Developed as a critique of social determinism, Actor-Network Theory (ANT) proposes that technologies and human actors influence each other. A more balanced perspective has developed recently that examines co-production of social phenomena and technology as part of a broader overall trajectory in social science research examining knowledge production and power.

Social Determinism: Social Construction of Technology

The first social studies of technological development concentrated on unpacking technological "black boxes" by studying "relevant social groups" — the people involved in design and development of technologies, and their influence on the form and definition of technologies during their formative stages. Pinch and Bijker (1992) argue that early in

their development, technologies are "interpretively flexible" and can have different meanings for different groups. Technological design responds to this flexibility: "there is not just one possible way or one best way of designing an artifact" (40). In Pinch and Bijker's classic example of bicycle development, relevant social groups included athletic young men cyclists, women cyclists, anti-cyclists and racing cyclists. Each of these groups had a different interpretation of how bicycles should be used, and their interpretations redefined the types of problems to which bicycle designers responded. For example, the problem of vibration due to wooden or metal wheels was redefined as a problem of speed by racing cyclists, leading to the adoption of air tires. While this made a "better" bicycle for racers, it did not necessarily improve the bicycle from the perspective of the other relevant social groups. SCOT was the first conceptual framework to address the creation of technologies as a social process involving a variety of actors and not only "famous men" inventors. The work described in this thesis has certainly been influenced by this approach of exploring all of the different actors involved in technological development. However, the SCOT tradition has limitations that make it inappropriate for my purposes here. It tends not to consider questions of use, and many questions of politics: in short SCOT does not create ways of addressing power differentials between relevant social groups, as Winner (1999) points out and Bijker (1995; 2002) echoes. In comparison, Hughes' (1987; 1983) work on the social aspects of systems design retains a focus on design, but introduces the concept of cultures of system design, as well as taking account of the impact of politics, making it more applicable here.

Political Determinism: Socio-technical Systems Development

Hughes (1987; 1983) applies a constructivist approach to describe how social and political factors influence the design and development of infrastructures and systems. Using the example of electrical power systems, he explores how cultures of systems development form around the values, ideas, and knowledge of elements that make up a system. For Hughes, political conflicts, rather than the negotiations between relevant social groups, are the primary determining factor in the development of electrical systems. Hughes sees human agency as operating through the process of making laws that govern different aspects of systems design. For example, he argues that electrical systems in Chicago, Berlin, and London were designed in different ways partly because of the political systems in each city. In London, where local councils ruled small areas, each parish or borough developed a different electrical system that did not necessarily interoperate with systems in other areas. Hughes' focus on the role of politics and systems design culture runs below this thesis' concern about how community WiFi becomes institutionalized. However, institutional politics are not the only kinds of politics bound up in technology development, and the focus on large institutions and corporations that Hughes employs does not fit with my examination of non-commercial technical development like community WiFi.

Power as Difference: Gender in Constructivism

Gender and identity politics also influence technological design. As I explain later in this thesis, technological development (even the grassroots technology production associated with WiFi and other computerization movements) is gendered. Feminist studies of technology question the relationship between gender, knowledge, and practice, using the

tools of constructivism to reflect on the way that gender and technology are mutually constructed. Cockburn (1983), Wacjman (2004) and Faulkner (2000) argue that gender identity and technology are mutually constituted: relationships to technology develop within existing gendered frameworks. As Faulkner writes, "the fact that popular images of both science and technology are strongly associated with the masculine side of [gender] dualisms must be one of the reasons why, in a deeply gender divided world, most girls and women don't consider a career in engineering" (11).

However, this perspective has also been criticized as essentializing gender by aligning technological knowledge with masculinity. As Grint and Gill (1995) point out, "there is a dynamic tension between the view that technology is closely related to masculinity and a perspective which sees this apparent association as itself ideological, based upon a narrow and specific understanding of the technical and a set of exclusions which position women outside the technical realm" (p. 4). These reflections politicize constructivism by reflecting on the way that existing social constructs like gender are interpolated with the construction of technology and technical expertise. More recent work from Suchman (2005) has contextualized the gendered quality of labour, and other studies of the constructed relationships between gender and technology include Wakeford's (1999) study of gendered work in an internet cafe and Shade's (2002) discussion of gendered virtual communities. Peddle, Powell and Shade (2008) analyse how labour becomes gendered within community informatics projects, pointing out that community projects may espouse progressive politics, but this does not mean that community informatics projects are free from feminized or gendered divisions of labour. Finally, Wacjman

(2004) proposes that a study of the gendered aspects of technology is at its core a study of how power operates through socio-technical formations. In studies of social constructivism, a continuing attention to power thus requires attention to gender.

Provocative Politicization: Actor-Network Theory (ANT)

Without explicitly addressing gender, the Actor-Network Theory perspective also addresses questions of power. It attempts to redress one of the failings of SCOT and previous constructivist traditions: the fact that only humans can be actors. ANT proposes that human and non-human actors are drawn together in a set of mutual relationships that includes nature, society, and hybridized objects like technologies. Latour (1991) breaks down the distinction between technology and society, hoping to re-examine the relationship between power and domination. He introduces actors and actants as the elements in this network.

Actants, either human or non-human, are possibilities that stabilize in the guise of one type of substance or concrete element. Actors mobilize these possibilities, and attribute to them goals and borders, thus transforming them. The mobilization of possibilities is called translation. Once linked together, these translated possibilities form a network of relationships. Latour (1991) argues that in establishing such a network of relationships, technical innovations can be revealed in their complexity, thus permitting a relativist view of both technology and social relations. Latour writes, "when actors are unstable and the observers' points of view shift endlessly we are entering a highly unstable and negotiated system in which domination is not yet exerted" (129). Neither technology nor the constructed category of "the social" is determinate. Technology is one voice among

many, but it does have its own voice, as evidenced by Latour's (1996) "novel" about the failure of a mass-transit system in which the train tells its own story of its development and its ultimate abandonment.

Three other key concepts emerged from ANT's close studies of technological development, particularly those conducted in laboratory settings and engineering design firms (Akrich 1992): inscription, scripting, and de-scription. From these sites came the observation that technological objects were inscribed by their developers with assumptions about technology's ideal form and desirable uses. Technologies were understood as developing along with scripts that represented the designer's expectations about how technology should be used: the scripts could be rejected (de-scripted), or accepted (in-scripted), but in all cases performed a kind of negotiation between the designer's expectations and the user's practices. For example, Akrich (1992) describes the development of a lighting kit by French engineers for use in developing countries, arguing that the designers did not expect the users of the lighting system to modify or adapt it, and thus created a closed, cumbersome system. The scripts that the designers attached to the lighting system failed and the people for whom it was designed attempted to change it. When their efforts at modifying both the technology and its scripts failed, they abandoned the system.

Criticisms of ANT

Actor-Network Theory's provocative claim that technologies themselves might provide their own kind of shaping force has been widely and usefully criticized (Law 1999; Slack

and Wise 2005), particularly for failing to account for differences in social power[ii], and also for its assumption that relationships between actors – whether human, non-human, or hybrid-technological – are symmetrical. This makes it difficult to align ANT with other social science research concerned with questions of power or the development of social structures. In addition, like much work in STS, ANT does not separate large-scale from small-scale relationships. One of the core principles of ANT is to use small-scale, detailed analysis to suggest broader political implications. This makes it very difficult to apply to social mobilizations, for example social movements that attempt to politicize technology like the computerization movements that interest me in this thesis. Still, post-ANT research in the STS and constructivist traditions has accepted the challenge of seeing both technology and society as fluid categories.

Balanced Perspectives on Constructivism: Co-production of Technology and Society

The previous review of the history of social constructivist approaches describes a shift in focus from social determinism, to a more nuanced focus on politics and power, taken to its extreme in the ANT claim for a radical symmetry between humans and non-humans. More recent constructivist work has developed a focus on the co-production of technologies and society through observation of how technologies operate as sites of knowledge transfer or exchange (Bowker and Star 1999) and as elements of controversies that mobilize opposing social or cultural perspectives (Callon 1981). Jasanoff (2004) defines co-production in terms of knowledge production: "[it is] shorthand for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it. Knowledge and

its material embodiments are at once products of social work and constitutive of forms of social life; society cannot function without knowledge any more than knowledge can exist without appropriate social supports" (p. 2). Co-production refutes the social determinism of SCOT while taking a position that aligns STS more closely with other social sciences. As Jasanoff notes, STS is interested in four sites of co-production: "making identities, making institutions, making discourses, and making representations" (p. 13). With these broader frames, elements of STS analysis can be bridged into other social scientific fields. STS approaches have been particularly useful in communication studies. In the next section of this chapter, I describe how the "special case" of communication research integrates constructivist perspectives from science and technology studies.

Constructivism in Communication Studies: Social Shaping and Consequences

The study of communication technology (and, as the next chapter explores, computers that have become framed as communication technologies) is often considered as a special case in the study of technology and society. Carey (1989) argues that while all technological change is in some ways a social process, development of ICTs is especially important because its results are the restructuring and mediation of communication itself, which is accompanied by important ritualistic and symbolic elements. In addition, increased access to information contributes to the informed decision-making that is essential for democracy. Furthermore, developing technology is itself a process of communication -- of negotiation between different relevant social groups through which the structures underlying political life are established. For these reasons, questions about

the design of and access to ICTs are fundamentally political questions, and the connection between design, governance, and appropriation of technologies particularly significant.

Compared to the design and development oriented studies of STS and ANT, media and communication studies research tends to focus on use – or appropriation – of information technologies. This is often described as a process through which material technical forms and symbolic representations join together. However, the study of technological development within communications studies has begun to focus on the entire process of the social shaping and consequences of technology (Lievrouw and Livingstone 2002). Various studies have developed conceptual tools to describe this process. For example, Mackay and Gillespie (1992), frustrated with the failure of both STS and Marxist approaches to examine technology's contexts beyond the role of structures and subjects in developing technology, drew on cultural and media studies for a more integrated approach. They examine "three conceptually distinct spheres 1) Conception, invention, development and design; 2) Marketing; and 3) Appropriation by users." (1992, p. 691). This begins a focus on technology as process, breaking down the artificial distinction between "design" and "use."

Proulx (2007) expands on the concept of appropriation, arguing that the "social appropriation of technology" takes the form of progressive steps: technical access; technical and cognitive mastery; meaningful integration into everyday practices; innovation and the creation of new practices; the mobilization of communities of

practice; and finally political representation of the interests of users through the development of policies. In comparison to ANT and to previous STS work, policy development is considered part of the co-production process within communication studies. Policy-making is part of the symbolic sense-making process that occurs around the production and consumption of ICTs. Dutton's (1999; 2004) work illustrates this approach: his theory of the ecology of games accepts that actors throughout the production, distribution, and regulation phases of technology development have conflicting goals that eventually shape the governance and structure of technical innovation. These actors do not necessarily behave rationally, but instead attempt to balance several different identities, relationships, and desires: for example, acting as government officials but also as parents or homeowners. In addition, policy-makers adopt different stances depending on their professional responsibilities, for example as employees of government departments with particular mandates. Using approaches like these, policy-making also contributes to the process of appropriation.

Using STS for Policy Research: Bridging

The policy environment can also configure the social impact of ICTs. The framework of co-production, as I describe above, helps to situate policy as one of the products of socio-technical change. Star and Greisner (1989) describe "boundary objects" – such as maps – that can be interpreted differently by different groups of people. These boundary objects help people establish common ground in contexts where many different types of expertise are developed. This process is called "bridging" and I use the concept to

describe how knowledge, practices, and material objects are transferred between different groups of people brought together by common cause. The non-commercial, community-based, self-organized social contexts where new ICT technology is produced and discussed create unique opportunities for bridging of all kinds. As I discuss below, my research design in this thesis has encouraged bridging of knowledge from participants. However, bridging also explains how ideas about the importance of ICTs in social life, and practices associated with them, appear in contexts different from the ones in which they were originally developed. Like the maps that Star and Greisemer describe as linking experts from different fields, ICTs can also act as boundary objects linking technical experts, social justice advocates, and policy makers. Newer or more flexible technology might inspire more bridges, as its social and political impacts are just beginning to be defined. As part of the co-production of technology and society, the concept of bridging helps to describe how ICTs are appropriated into social life and into policy discourse.

Through these analyses, communication studies has begun to integrate design and appropriation into a single framework that remains focused on the political implications of ICT development and appropriation. Lievrouw and Livingstone (2006) argue that "media and information technologies comprise the material systems themselves and their social contexts, including the artifacts or devices used to mediate, communicate, or convey information; the activities and practices in which people engage to communicate or share information; and the social arrangements or organizational forms that develop around the devices and practices" (cited in Boczkowski and Lievrouw, 2007 p. 955).

Each of these three categories of media and communication technologies influences the other: "design," "appropriation" and "regulation" are all part of the same co-production process.

Links between STS and Communication Studies

Links and bridges between different spheres of knowledge related to technology characterize co-production. Material objects like new technologies can provide links between different groups of people with otherwise diverging interests. These bridges permit actors to have influence in a variety of different spheres. Similarly, the study of technology in communication studies has developed through links with STS: Boczkowski and Lievrouw (2007) describe three bridges that link STS and media and communication studies. These bridges are, broadly speaking 1) concerns with the process, 2) consequences and 3) causality of technology. For example, a concern with process motivates both ANT laboratory studies and the analytical framework of the ecology of games. Questions of causality are implicit in the very nature of constructivism itself, which assumes that technology does not change society, but which also raises questions about the extent to which social changes contribute to technical changes.

Boczkowski and Lievrouw highlight the contrast between Eisenstein's (1983) assumption that changes in printing technology had revolutionary consequences and Johns' (2000) focus on the *processes* inherent in the culture of printing and reading. To reconcile this split between framings of technology as determinist and contingent, Lievrouw proposes

conceptualizing "determination and contingency [as] interdependent and iterative and . . . this relationship can be seen at key junctures or 'moments' in . . .media development and use" (cited in Boczkowski and Lievrouw, 2007 p. 957). Second, a focus on process marks studies of both the production and the consumption of technologies, from Akrich's concept of "inscription" that draws from STS, to studies of communication technology markets and the domestication of technology in the household (Silverstone and Hadden 1996). The third bridge, a concern with consequences, encompasses an ongoing debate about whether technological changes produce discontinuities (Schement and Curtis 1995; Schement and Lievrouw 1987), or whether there is a more fundamental continuity in their uses and practices. The discontinuity perspective argues that changes in technology have contributed to the development of an "information society" distinct from other societies (Bell 1973, 1979) while the continuity perspective focuses on similarities between the political economics of media and communications at previous moments in history (Mosco 1996; Robins and Webster 1999; Schiller 1981).

The increasing "banalization" of communication technologies, as Lievrouw (2002) argues, suggests that there is more continuity between societies than discontinuity as a result of technological shifts. Indeed, the philosophical consequences of assuming that technological changes mark revolutionary watersheds has been criticized in STS by Winner (1986), who argues that its focus on the linkages between social and technical forms often undermines the potentially negative political consequences of technological developments, including the expansion of "technological society" and in media and communication studies by philosophers of technology including Barney (2004), who

criticize the philosophical consequences of conceptualizing communication as operating in a network. However, perspectives of co-production can also focus the interest in consequences that emphasizes both the continuous and the discontinuous, which can include all types of social consequences, including a more refined sense of the political consequences of technology development. Particularly, a co-production perspective might claim that society promises overall continuity, but that some discontinuity can emerge at critical moments when combinations of social and technical factors may permit more flexibility, before "hardening" into more rigid structures. I believe that this may be the case for some of the social and political changes connected with community WiFi.

The constructivist perspectives bridging STS and communication studies highlight process, consequences and causality as points of departure for analyses of the social implications of the development and use of communication technology. I argue that representations through discourse, practice, and material constructions are part of this process. In the following section, I discuss three approaches that provide theoretical tools that can be applied to my analysis of the co-production of WiFi technology and new social, organizational, and policy forms. Marvin's (1988) discussion of expertise in the electrical field establishes discourse as a key means of establishing the social role of a new technology, while Slack (1997) and Slack and Wise (2005) introduce the category of assemblage to describe specific points of connection between technology, ideology, and organization. Finally, Turner (2005, 2006) identifies the network forum as a site of co-production of technology, culture, and networked organization, where bridging of discourse takes place to connect them. These concepts are applied later in the thesis, but

I present them here as a way of situating my thesis within the constructivist tradition in communication studies.

Symbolic Representations of Communication Technology

Carolyn Marvin: Discourses of Expertise

Marvin's (1988) study of electricity begins by asserting that electricity is fundamentally a communication technology. Marvin conceives of technology as a practice whose implications can be understood through the discourses produced around them: she considers how "electric literacy" connected the technology of literacy with the emerging electric technology. Not only does electricity require specific kinds of knowledge, but the practice of writing and reading about electricity also creates communities of "literates." Discourses were produced by and circulated among these groups of literates, who were also elites trying to establish themselves as experts. Marvin pays special attention to the way that power relations framed in terms of access to or expertise in electrical technology are laid over existing power structures relating to race and gender. She writes, "jokes in the electrical press were aimed mostly at those with little social power, occupying either the conditions of misery that electrical progress was supposed to alleviate or positions that would have to move aside to make room for electrical success" (p.19). In this analysis, "electrical success" implies that the community of "non-experts" (framed in many of Marvin's citations as being women, non-white, poor, and/or rural) must abandon their mechanical metaphors for understanding technologies, and their emotional responses, which are deemed unsuitable in comparison to the "social and moral superiority" (p. 22) of electrical experts.

Marvin's focus on the gendered and class identity of experts reiterates that existing structures of dominance can influence the ways in which new ICTs are contextualized: not least by influencing who become experts and to whom they speak. However, the limitation of her approach is that she looks only at discourse, not at the practices that may have undermined the elite understandings of expertise – as Fischer (1992) and Martin (1991) reveal in the case of the telephone, women developed expertise as end users and managers of the technology, despite "expert" assumptions to the contrary. What Marvin contributes to constructivist research in communications, and for this thesis in particular, is a clear conceptualization of the role of discourse in establishing emerging social imaginaries connected to technologies. For a more abstract conceptual perspective on how social life and technology are connected, I next consider articulation theory as developed by Slack and Wise.

Jennifer Daryl Slack and J. Macgregor Wise: Articulation Theory

The cultural studies approach to constructivism responds to the fact that "there are no necessary correspondences" between ideologies, practices, and social groups (Sterne, 1999, cited in Lievrouw and Livingstone 2002) by examining how these elements are connected together – articulated – by discourse and practice in particular times and locations. Hall (1983) introduces the concept of articulation theory to describe how material elements, practices, and social groups are connected; articulations are "lines of tendential force" linking political ideologies with particular cultural assumptions. These are not determined by the origins of the ideologies or assumptions – Hall elsewhere describes the contingency of articulations: "the so-called 'unity' of a discourse is really the articulation of different, distinct elements which can be rearticulated in different

ways" (cited in Lievrouw and Livingstone 2002 p. 490). Articulations are a more subtle way of connecting together otherwise separate concepts – without focusing specifically on individual representations of these concepts, as is the case with studies of discourse.

Slack (1997) applies articulation theory to the connections between social forms and technology. She argues that technology is fundamentally a set of connections between material objects and ideas, which can be articulated to a variety of other social practices, organizational structures, and paradigms. In the same way that ANT considers technologies as hybrid actors connected with humans and other non-humans in a network, Slack argues that technology is best described as an articulation: "a non necessary connection of different elements that, when connected in a particular way, form a specific unity" (1989 p. 331). For example, she describes the computer as an articulation of elements (hardware, software, network) that can be connected with other elements (politics, gender, economics). These connections are not natural, necessary, or dictated by "progress" – they are instead temporary and fluid.

Slack and Wise (2005) expand upon this analysis to argue that technologies are part of assemblages that can include articulations between "actions, passions, practices, commitments, feeling, beliefs, affects, and so on" (p. 130). The concept of assemblage draws from Wise (1997) and explains how technologies can be articulated, contested, disarticulated, and then rearticulated to other concepts. Thus, technical systems are not separate from social systems, but instead should be thought of as articulated together with them. However, these assemblages change over time, so that it is possible to track the

different ways that technologies are articulated to different ideologies and situated within different social forms. For example, Slack and Wise describe how the constellation known as the "Big Dipper" has, at different times and places connected together different myths and means of navigation – as well as different stars.

Unlike the depoliticized negotiations between designers and users in ANT, the contingency of different articulations and assemblages depends on where and how power circulates. Slack and Wise assert that technologies are political: their contingent connections can maintain the political interests of the powerful. To illustrate, they refer to Winner's (1986) controversial example of how engineer Robert Moses, purportedly afraid of facilitating travel by blacks and the poor, called for the construction of highway bridges too low to allow bus passage. The bridges have remained in place, as has the articulation between Moses' politics and the bridge's built form. However, re-articulations between the bridge and politics have also occurred, including Woolgar's (1991) assertion that the shaping of the bridge was more complicated than merely being an integration of Moses' politics into the built form.

Articulation theory is a particularly useful tool for constructivist analysis because it creates a way of visualizing sets of connections between particular ideologies and practices as they emerge in context and change over time. It also provides a framework for politicizing technology: articulations have their own politics, and some can be preferred to others. However, the major drawback to articulation theory is its lack of empirical applications. While Slack and Wise provide a host of examples to explain

articulation theory, they do not provide any suggestions on how to identify assemblages of articulations, nor how to shift or re-articulate them. Touching on many of the same issues but working more empirically, Turner (2005; 2006) uses the concepts of the network forum and the bridging of discourse to describe the process by which people who might have articulated technology with different sets of values and assumptions are able to come together.

Fred Turner: Networked Forums and Bridging discourses

Integrating cultural studies and STS, Turner (2005; Turner) argues that articulations of technology are formed in specific contexts. One of these, the network forum, establishes venues "in which members of multiple geographically dispersed groups could communicate with one another and in doing so come to see themselves as members of a single social network" (2005 p. 489). Turner describes the network forum, which can be a type of media or a physical meeting, as providing the opportunity for an exchange of different perspectives on technology where participants develop a common working language without relinquishing their ties to existing social networks. He likens this development of a "contact language" to the shared objects with multiple definitions that scholars in STS have analyzed. In particular, he refers to material objects like those that Star and Greisemer (1989) call boundary objects. Because Turner focuses on sites of exchange where knowledge about new technology is shared, his framework is particularly applicable to social movements mobilized around technology.

Turner's network forum functions by acting as a location where discourses and practices from different social worlds[iii] can be bridged. This bridging fills holes in social networks,

and also shifts the way that the role of technology is discussed and understood by different communities. His analysis of the relationship between the California counterculture and the development of the internet economy focuses on the way that the Whole Earth Catalog acted as a text-based network forum bringing together countercultural 'new communalists' who pursued ideals of self-sufficiency through technology, and computer hackers who explored the potential of open access computer technologies to advance their individual freedom. These hackers often considered individual freedoms to be more important than collective rights, an ethic described as libertarian. Although this perspective contrasted with the new communalist ethic, various network forums brought people with these ideologies together in situations that established new technologies as resistant, perhaps even utopian. These also included a Hacker's Conference organized by Stewart Brand, the former editor of the Whole Earth Catalog, and the development of the Whole Earth 'Lectronic Link (WELL), an early bulletin board system/online community in San Francisco.

With the concept of the network forum, Turner explains how particular social imaginaries are mobilized through connections developed by communications technologies – often through the personalities and backgrounds of individual people who develop them. The drawback of Turner's network forum is that he describes it as primarily producing new forms of language, without considering whether technical forms might also be products of networked forums. My application of the concept of the network forum in Chapters Five and Six draws on the broader principles of co-production to argue that technologies, as well as discourses, can link together different social imaginaries.

The concepts and analytical approaches developed by Marvin, Slack and Wise, and Turner form part of the fundamental conceptual grounding of this thesis, where they are applied to the social, policy, and technical forms co-produced through the community WiFi phenomenon. Two of the social forms that I consider most important are "communities" and "publics" as they are produced in connection with media and communication technology. The following section introduces communities and publics as they are conceptualized within communication studies, as well as in studies of community networking.

Communication Technology, Publics, and Communities

The 'special case' of constructivist research on communication technologies rests on an assumption that communication media are important as a means of constituting society through the circulation of ideas, and that ideas are essentially society's symbolic products. Shared ideas create social imaginaries, or ways that people think of themselves as being together. Two social imaginaries - publics and communities- are potentially mobilized through the process of constructing and using WiFi networks as they are through other technologies and media forms. This section introduces these concepts and explains their importance to this investigation of community-based technology development.

Philosopher Charles Taylor (2002) defines "social imaginaries" as "ways in which people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper

normative notions and images that underlie these expectations" (p. 106). Unique social imaginaries, Taylor argues, emerge at particular moments of history when social changes occur. In contemporary society, social imaginaries are constituted or reinforced through the process of communication. I argue that, in addition to emerging in many other situations, social imaginaries are created through the development and appropriation of WiFi technology. It is possible to make a distinction between two broad social imaginaries: "publics" which have a politicized, expansive quality linked to the ideal of a democratic voting public, and "communities" which are more bounded (often by geography) and affective, as well as defined by a sense of their uniqueness from other social forms. In communications studies, these two concepts glide into and overlap one another, and some of this ambiguity extends to this thesis. While this fluidity is unavoidable when describing the shifts of contemporary social imaginaries, the following sections outline how the expansive, politicized conception of a public differs from the more contained, affective conception of community.

Publics

Beginning with Dewey's (1964) suggestion that a newspaper could contain enough information and reach enough people to inspire the development of an ideal democracy, the idea of publics draws from an assumption that being able to distribute ideas among a large group of people inspires political knowledge and participation. Every form of media has its public: for example, readers of newspapers, viewers of television, audiences for political speech, or commentators on online media. The listening or viewing public is ideally meant to encompass the decision-making public – the rational decision-makers of a democracy, whose actions take place in a public sphere that Habermas (1989)

characterizes as the site of reasonable discourse and civility, separated from the private sphere of education, family, and home. Habermas argues that the lifeworld of concerns about education, child-rearing, and democratic participation always risks being colonized by the system of rationalization and institutionalization. He proposes communicative action, a form of symbolic interaction, as the means of producing productive rationalizations that structure society without producing an alienating rationality. This communicative action takes place, ideally, in a public sphere.

Habermas's bourgeois public sphere, a symbolic realm where political discourse takes place separated from the state and where an educated, rational public makes critical decisions, is often held up as the ideal communicative state. For Habermas, the publics produced and sustained through communication make communicative acts centrally important for the development of democracy. In his *Structural Transformation of the Public Sphere*, he argues that institutions including newspapers, coffee houses, novels, and magazines contribute to differentiating the public sphere from the state and from the private sphere by facilitating a structural transformation that favoured individualism and expression in public. Fraser (1992) criticizes the elitism of this concept of the public, arguing that it excludes participation by women and members of non-dominant groups.

More broadly Warner (2002) argues that publics are social spaces created by the reflexive circulation of discourse. Warner understands this exchange of discourse as the site of pure political engagement, outside of the framework of the state: "speaking, writing, and thinking involve us—actively and immediately—in a public, and thus in the being of the

sovereign" (p.51–52). If speaking, writing, and thinking are the foundations of sovereignty, then the media through which they are communicated become politically important as well. Warner's insistence that publics are defined by spaces of circulation as opposed to places or institutions inspires him to develop Fraser's (1992) concept of counter-publics – "parallel discursive arenas where members of subordinated social groups invent and circulate counter-discourses to formulate oppositional interpretations of their identities, interests, and needs" (cited in Warner, 2002 p. 118). Counter-publics are ways for elements of the private to be made public: they can also be ways for people marginalized by the creation of publics in the dominant media to find a voice. Downey and Fenton (2003) argue that the development of counter-publics is facilitated by the internet and networked forms of media production and organization.

Publics (and counter-publics) coalesce around communication media, which permit them to create a shared space of exchange, which is ideally democratic. Fraser (1992) has criticized Habermas' idealized public sphere as being inaccessible to a wide variety of people including women and poor people. In response, community and alternative media can create outlets for stories and perspectives not covered by commercial or government-controlled media (Downing 2003; Kidd). Arguably, the structure of the internet itself can mobilize new types of publics and counter-publics (Papacharissi 2002). In the chapters that follow, the emergence (or failure to emerge) of WiFi publics is examined along with, and sometimes in contrast to, the emergence of locally-relevant "community WiFi."

Communities

There are similarities between conceptualizations of mediated publics and mediated communities. Anderson (1991) argues that communities do not exist except by being collectively imagined by their members. This suggests that communities develop around forms of media like newspapers, maps, or even monuments. However, compared to the broader understanding of "public," community is more bounded, even when it is imagined as transcending the geographic and cultural constraints that characterized the first social scientific definitions of community. Tönnies (1887, trans. 1955) defined community (gemeinschaft) as a "unity of will" in opposition to society (geschellschaft). This traditional sociological definition takes village and family as primary sites for development of community, and although social research now concentrates on a profusion of types of community including "geographic communities, virtual communities, communities of circumstance that grow from situations of need, and communities of interest" (Fraser 2005) there remains an understanding that identifying a community implies connectedness and commonalities, whereas a public implies broader political mobilization.

Warner (2002) argues that the difference between a community and a public is that the public is composed of strangers, or at least of people who do not organize their interactions based on deep affective knowledge of one another. In contrast, a community draws on this deeper affective bond as part of its self-definition. Etzioni defines communities as "social entities that have two elements. One, a web of affect-laden relationships among a group of individuals, relationships that often crisscross and reinforce one another, and the other, a measure of commitment to a set of shared values,

norms, and meanings, and a shared history and identity – in short, a connection to a particular culture" (2004, p. 225). Day and Murdoch (1993) also evoke the bounded nature of community, arguing that when people talk about their definitions of 'community', they focus on the symbolic links between a geographic area and a shared ideological background. The bounded quality of community is meant to suggest closer affective connections than the political concept of publics. Perhaps for this reason, media and communication technologies are often leveraged to fulfil goals like building or sustaining community.

Community Networking and Community Informatics

The goal of creating and developing community has, like the creation and development of publics, been mobilized by communication technology. Two linked fields, community informatics and community networking, investigate the theory and practice of this mobilization. While it is difficult to draw strong distinctions between these two areas, community informatics, "concerned with the development, deployment and management of information systems design with and by communities to solve their own problems" (McIver 2003 p. 33) is more oriented towards design, and community networking, which investigates both on-line "virtual communities" and local place-based communities, is focused on community use of technology, sometimes with the goal of changing policy to afford a greater accessibility of information technologies. Community informatics draws from "the assumption that geographically-based communities (also known as 'physical' or 'geo-local' communities) have characteristics, requirements, and opportunities that require different strategies for ICT intervention and development from the widely accepted implied models of individual or in-home computer/internet access" (Taylor

2004 p. 4). Gurstein (2000) notes that "community informatics pays attention to physical communities and the design and implementation of technologies and applications which enhance and promote their objectives."

Stillman (2004) describes community networking as providing a "seemingly endless variety of forms [that examine] the interface between people and technology" (p.2). This variety of forms often includes assessment of ICT projects undertaken within different types of communities (mostly geo-local communities). As Stoecker (2005) notes, analysis of community networking has proceeded in two general directions: 1) assessment of ICT projects in local communities, and 2) explorations of the "virtual communities" made possible through the application of networked technologies[iv]. In addition, community networking initiatives form the basis for challenges to communications policy because they provide critical alternatives to existing communication networks (Loader and Keeble 2004). Representative literature in the first category includes Marshall et al's (2004) comparative study of the regional impacts of ICT, as well as Myles' (2004) study of the role of community intermediaries in creating and sustaining local networks, Boase et al's (2006) assessment of internet use within geographic communities, and Dutta-Bergman's (2005) study concluding that internet access increases the satisfaction of residents about the communities they inhabit.

The second category includes substantial work in the field of computer-supported co-operative work, including Carroll and Rosson's (2003) analysis of the design features that permit virtual communities to produce the same social benefits as place-based

communities. Explorations of virtual or on-line communities include not only Rheingold's well-known (1993) reflections on the WELL, but Wellman and Gulia's (1999) examination of connections between online and "offline" communities; Hafner's (1998) examinations of the role of the WELL in defining the virtual community, Turkle's analysis of the consequences of "life on the screen" (1995) and Shade's (2002b) analysis of the role of gender in the development of virtual communities. In an overview of this tradition Jones (1999; 1997) reflects on the transformation of internet studies from the study of virtual communities towards a greater focus on the integration of online and offline modes of interaction.

A third strain of community networking research focuses on the political contributions of local networking projects. Day and Murdoch (1993) argues that community networking ideally contributes to community development. Clement and Shade's (2000) access rainbow defines a framework for increasing community appropriation of ICT, focusing on the layers of access required, beginning with access to infrastructure and ending with governance. Shade (2002a) also describes the policy implications of supporting ICT networks that empower local communities. More broadly, Feenberg and Bakardjieva (2004) posit that community networking projects may act as a form of 'democratic rationalization' which they describe as "user interventions that challenge harmful consequences, undemocratic power structures, and barriers to communication rooted in technology" (2004, p. 186). Democratic rationalizations may not necessarily operate by creating state-level policy, but they are nonetheless political interventions because they reshape elements of technical systems perceived as unjust. Therefore community

appropriation of technology can contribute either to high-level policy changes, or its political impact may be felt through interventions that alter the structure and context for technologies at a smaller scale. Democratic rationalization also suggests that communities can have a political impact, potentially in a different way than publics whose development is conceptualized as more directly linked to democratic political participation. Broadly speaking, community informatics and community networking are critical forms of "computerization movements": non-commercial organizations that promote the social benefits of computerization. As the next chapter discusses, computerization movements are one important site where the social imaginary of "community" is co-produced along with technology.

Communities and publics are social imaginaries that can develop through mediated communications. This section has summarized definitions of communities and publics, focusing particularly on assessments of the development of communities and publics through the use of media and communication technology. The following chapters examine how communities and publics form within, or are evoked by, social mobilizations connected with WiFi technologies. These mobilizations, in turn, impact technical and policy forms. This sociotechnical process unfolds on several different levels; however, the conceptual tools provided by Marvin (1988), Slack and Wise (2005), and Turner (2005; 2006) provide ways of grounding the analysis by examining discourses, articulations, and network forums. The next section describes how I have developed these concepts through empirical, participatory research in two specific case studies and within the broader CWN "movement."

Methods for Exploring Co-production

Socio-technical research in communications studies assesses the range of social, technical, and hybrid elements influencing mediated communication. The methods used by previous researchers in this area draw on a variety of data sources. For example, Marvin (1988) focuses on print media, following the discourses circulated through trade and popular publications produced for or discussing the electrical elite in the early 20th century.

Turner (2005) draws on print sources as well as face-to-face interviews and records of meetings, as well as the technical design of the WELL, to explore how the design of the WELL encouraged sociability. Hughes (1983) consults maps, plans, the design of devices, and technical schematics for the development of electrical systems. These sources of data permit an analysis of how different groups of people wrote about, talked about, schematized and designed technologies within specific social contexts. However, the historical approach of each of these projects fixes the practices of the people involved in producing these texts, discussions, and schematics in time. In contrast, my research has concentrated on changes taking place in times and spaces I myself occupied. It establishes me as a researcher-activist, and the focus on bridging, knowledge-sharing, and the policy impacts of WiFi draws from my involvement both with local WiFi projects and with broader community wireless networking mobilizations.

Ethnography

An alternative to historical approaches like those used by Hughes, Marvin, and Turner is ethnography, which focuses on the evolution of discourses and practices in lived social life, over time. In STS, ethnographic approaches have focused both on design and on use. In the ANT tradition, Akrich (1992) examines the process by which new

technologies are inscribed with values and assumptions of their designers. Oudshoorn, et al (2004) provide an STS critique of the gendered aspects of inscription, especially the consequences of designers using their own experiences as a way of conceptualizing their users as "everyone."

In communication studies, ethnography is the primary means of investigating the "domestication" of technology, examining the complexity and significance of everyday practices of technology (Silverstone and Hadden 1996; and see the review by Haddon 2004). This tradition's focus on situated practice has also influenced analysis of communication technology's (and especially the internet's) intersection with gender (Shade 2002b; Wakeford 1999; Kendall 2002) place (Hampton 2001; Miller and Slater 2001; Wellman 2001) and race and ethnicity (Kolko, Nakamura, and Rodman 2000).

Within the community networking research tradition, ethnography (especially participatory ethnography) is considered a form of advocacy that contributes to the development of community networking organizations and the broader communities they serve (Taachi, Slater, and Hearn 2003). Otherwise, ethnography is used to describe the influence of community networks on life in a geographic community. In this field, representative studies include Cohill and Kavanaugh's examination of the Blacksburg Electronic Village (1997) Pinkett's, (2003) participatory ethnography of the Creating Community Connections project linking MIT researchers and a Cambridge, MA housing estate; and Clement et al's (2003) study of the everyday uses of community networks and home internet service in inner-city Toronto. Bakardjieva and Smith (2001) also use

ethnography and unstructured interviews to interrogate the idea of "virtual community." Finally, ethnography has also been used to explore the qualitative experience of the digital divide (Clark and Demont-Heinrich 2004). These examples indicate how ethnography can be used to study the affective nature of community as it develops through community networking projects. As internet access and networked communication have become integral to everyday life and of research practice, virtual ethnography, involving observation of and participation in social practices online (Hine 2000) has supplemented conventional ethnographic research practices including participant observation, open or semi-structured interviews, and detailed "thick descriptions" of situated practices (Hammersly and Atkinson 1995).

Multi-sited Approaches

In this thesis, I have chosen to pursue a multi-sited research approach drawing from documents, designs for WiFi networks, and participation in and observation of discourses and practices of community WiFi developers, as well as quantitative findings that can be used to contextualize the qualitative insights. Comprising three main sites: a grassroots community WiFi group in Montreal (Île Sans Fil), a municipal WiFi project in Fredericton, New Brunswick, and the North American "Community Wireless Networking (CWN) Movement," it follows the evocation of communities and publics through the development of non-commercial WiFi networking.

This thesis grew from a two-year ethnography of Île Sans Fil, and expanded to track new contexts and discourses for WiFi. Developing the research strategy iteratively, I was inspired by the ANT approach of "following the actors" and observing how they

themselves described the multiple contexts and meanings of their engagement with technology. As Latour (2005) writes,

> It is in these kinds of spots that we have to take a decision if we want to trace social connections in new and interesting ways: we must either part company with the analysts who have only one fully worked out metaphysics or "follow the actors themselves" who are getting by with more than one. Concreteness does not come from choosing some figuration over some other ones in the place of the actors, but from the increase, in the accounts, of the relative share of mediators over intermediaries (p. 58-61).

In ethnography, this pursuit of multiple actors and multiple contexts is referred to as a "multi-sited imaginary" (Marcus 1995) where the sense of the phenomenon under consideration is assembled from diverse sites and actors. Both Marcus (1995) and Saukko (1998) argue that using more than one ethnographic site expands the utility of this method: taking a similar position Marcus (1998) writes, "within a multi-sited research imaginary, tracing and describing the connections and relationships among sites previously thought incommensurate is ethnography's way of making arguments and providing its own contexts of significance" (1998 p. 14). Necessitating an iterative and reflexive research stance that changes with relation to each site, the multi-sited imaginary negotiates between describing the world as it is and abstracting the elements that connect together similar elements in different locations. In the cultural studies tradition, multi-sited studies connect places with flows, people and practices with ethnoscapes, technoscapes, and mediascapes (Appadurai 1996). Saukko (1998) argues that these methodological practices nourish interdisciplinarity and an attention to structures of power. However, multi-sited work can be limited if it only assesses one aspect of culture across many sites. Instead, the variety of sites should be used to interrogate several

different aspects of culture. I find this a particularly productive approach for exploring the co-production of WiFi technologies and the new social and organizational forms associated with them.

Finding the Middle Ground

Hine (2007) argues that multi-sited research engages with a "middle ground" that comprises the terrain that emerges as a research site, as well as the researcher's own shifting position between different research sites. The multi-sited imaginary questions established expectations about what the boundaries of a "case" should be, and provides an opportunity for reflection on the nature of methodology itself. Hine also argues that multi-sited imaginaries engage with the "middle range" of studies that straddle the split between attempts at providing focused, local description and those hoping to develop a "theory of everything". In STS, the middle range connects the thick description of ethnography (originally laboratory studies) with the high theory of ANT, or with studies of the institutionalization of technical forms (Geels 2007). In communication studies, middle-range theories can bridge focused discursive and ethnographic studies of production and consumption with the more abstract articulation theory, or even bridge the cultural studies and political economy traditions (Vaidhyanathan 2006). In this project, striving towards work at the middle means applying techniques of ethnography in a way that produces insights about the socio-technical process of defining and building WiFi in connection with various types of communities and in turn connecting those insights to the socio-political consequences of the process. The middle ground is also a terrain of negotiation for my own position within the research process, encouraging me to think about the connections between institutionalized academic research and the more

grassroots modes of engagement that characterize local WiFi projects and broader WiFi mobilizations.

For this reason, my multi-sited study draws on documentary evidence, interviews, and technical documents produced at each site. Primarily a qualitative research study, it also draws on quantitative data gathered through surveys and monitoring of the use of WiFi networks. This thesis contributes to a growing field of research on WiFi and its political and social impacts. It also represents a uniquely situated perspective: the cases are not comparative, not closed, and were never visited by an "objective" researcher. As a researcher, student, and activist, I am part of the stories that I tell about CWN. However, this situated perspective and multi-sited methodology have inherent shortcomings, since situated perspectives privilege some kinds of knowledge and overlook others. The content as well as the tone of this thesis illustrates the way that situated perspectives can shift. This literature review and the following historical summary are more detached, while I introduce the case study chapters with stories introducing the people, places, and ideas that I encountered. Storytelling reiterates that one of the roles that a researcher-activist can play is as a narrator, linking ideas and people together in one of many possible trajectories.

Neither my stories nor the analysis in this thesis accurately represents all of the experiences and perspectives that are part of the CWN phenomenon. However, my situated perspective also draws on rigorous qualitative (and even some quantitative) research methods. The specific techniques used in each case are described in the relevant

chapters, along with further reflection on their individual limitations, but first I discuss some general issues of participatory research.

Participatory Research

Unlike the studies mentioned earlier that used historical data, my exploration of WiFi was conducted as the technology and its meanings evolved and shifted. Although constructivist research argues that the meanings of technologies are never entirely "closed," early phases of technical development introduce a proliferation of interpretations of technology. As I conducted research, I participated in constructing discourse and defining practices. My own movement through the three research sites and my engagement with each attempts to balance a necessary attention to local context and detail with an understanding of the different contexts provided at each site.

Participatory research implies a level of commitment and involvement by the researcher. For example, in community networking research, participatory methods are intended to contribute directly to evaluation and improvement of the projects they are engaged in research with, through the methodologies suggested in participatory action research (PAR) (Lennie and Hearn 2003). Practical tools and methodological techniques concentrate on the feedback loop between research, evaluation, agenda-setting and service delivery (O'Neil 2002; Stillman and Stoecker 2005). Still, the effectiveness of PAR depends, as Stillman and Stoecker (2005) point out, on the time and experience of researchers.[v] Graduate students have conducted most of the research on community wireless networking as participants in CWN initiatives[vi]. The enthusiasm and time that graduate students are able to dedicate to research (as well their potential political

motivations) may have assisted in creating a participatory research culture connected with CWN. My own engagement with CWN has been contextualized by participation in larger research projects emphasizing participatory research, connections between academia and advocacy, including the CRACIN and CWIRP projects, which are described in Appendix One. Being involved in policy-relevant research projects has inspired me to employ a participatory approach but also sparked my interest in pursuing public-interest and policy relevant research. The politicized nature of CWN projects also inspired other researchers, many of who have remained involved in political advocacy related to community WiFi after completing their thesis research projects.

A more refined set of conceptual tools assist in critical reflection on this aspect of co-production. For example, theoretical frameworks for new social movements (especially Touraine 2000, 1988, 1977), which I employ in Chapters Two, Five, and Six, consider that social movements (including the media reform movements that I discuss in Chapter Six) that depend upon the participation of 'movement intellectuals' who help to define the social relevance of the social movement, as well as providing legitimacy for many of the movement's outcomes. Dutton (2006) outlines the challenges for researchers participating in the media reform process, noting that stereotypes of researchers as irrelevant and apolitical can be overcome – but sometimes with difficulty. He identifies five types of actors participating in media reform: academics, activists, foundations, bridges, and specialists. Of these, academics may not necessarily make the strongest contributions to policy change, because the nuanced perspectives of research may not align with the more polarized perspectives of policy-makers. Dutton's analysis suggests

that ‘movement intellectuals’ may stand to benefit more from the increased credibility of participating in grassroots activism than activists stand to benefit from academic research and suggests creating relationships of collaboration to prevent academic researchers from acting as “hired guns.” Still, researchers within social movements are situated in an awkward position, where a positive contribution to the movement may be outweighed by the personal and professional benefit they draw from participating in it.

Ideally, collaboration creates benefits for all of the people involved, although some may benefit more than others. As a means of conceptualizing the relationship between researchers and “the researched” in ethnography, Thomaselli (2003) suggests working through a “reverse ethnography.” This thought experiment traces the relationships created during ethnographic research, and calls into question the necessary authority of the researcher. A reverse ethnography allows all of the participants to see how research relationships are reciprocal and constructed: a research text abstracts the experiences of active participants, but it also provides a way for participants to see the value of their activities. Researchers can promote reciprocity by facilitating access to research findings as they develop and allowing self-reflexivity for all of the participants in the research process.

Although my research position shifted as I explored the different cases presented in this thesis, I have attempted to create reflexivity and reciprocity throughout the process. I distributed research results to the people involved in producing them, and solicited feedback on future research plans. I made public presentations to various groups of

actors including government representatives and policy-makers and created educational resources related to public and community use of networked communication technologies.[vii] In many ways, therefore, I have contributed to discursively framing WiFi as a "community technology."

Conclusion

In this chapter I have reviewed literature from social science traditions concerned with the relationships created between society and technology, beginning with the STS tradition and then examining key works that employ social constructivist perspectives within communication studies. I have presented three important sets of concepts useful for understanding the co-production of technology and society: discourses of technical expertise, articulations between technology and society, and network forums that assemble people, technologies, and shared forms of knowledge. I have also explained how the concept of a social imaginary can be used to describe the emergence of social forms like communities and publics that are associated with communication media and technologies, and which emerge with relation to WiFi. Finally, I have argued that ethnographic and multi-sited methods are useful tools for understanding the co-production of technical forms and social forms, which has inspired reflection about my own participation in the co-production of WiFi technology and social forms. With this chapter I have situated the study of the community WiFi movement's co-production of social forms, technology, and policy within communication studies. In the following chapter I begin to set the historical and social context for this co-production by situating community WiFi networking as a contemporary "computerization movement": a form of

advocacy of computing technology by non-commercial actors. I examine the continuities and discontinuities between previous computerization movements and the community WiFi phenomenon, arguing that computerization movements offer a critique of technocracy that can also contribute to the development of new socio-technical institutions.

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Notes

[i] These debates are historically linked to the split in the Frankfurt School between Habermasian notions of "system/lifeworld" distinctions and Marcusian ideas of integrated nature and culture.

[ii] Although a pure ANT theorist would argue that making distinctions between "technology" and "society" is arbitrary. In this thesis technology and society are understood to be co-produced, but separable.

[iii] Turner's conception of 'social world' can be taken as analgous to 'social imaginary' as I define it below and as it is used throughout this thesis.

[iv] The concept of 'virtual community' was introduced by Howard Rheingold, and marked a turning point in the way that the interactions made possible by networking communications technologies were discussed: previous to the publication of his 1993 book, as Turner (2005) notes, "researchers generally did not take up the question of on-line communities as such. Rather, they focused on computer mediated communication, principally on the ways in which computer technologies shaped interpersonal communication and thereby the performance of work groups, teams, and commercial organizations. For examples, see Ronald E. Rice, "Issues and Concepts in Research on Computer-Mediated Communication Systems," *Communication Yearbook* 12 (1988):

436–76,and Lee Sproull and Sara B.Kiesler, *Connections: New Ways of Working in the Networked Organization* (Cambridge, Mass., 1991)" (Turner 2005, p. 486).

[v] He suggests, in particular, that large-scale research tasks should be distributed across research networks (p. 13). In the context of this thesis, the research on CWN was situated within three larger research projects (CRACIN, CWIRP, and the LabCMO – detailed in Appendix One) which not only provided financial support but also acted as research networks that produced broader research results (surveys, literature reviews, policy reviews), some of which I draw on here. Within the CWN movement, survey research of local CWN development was conducted along with members of Île Sans Fil and with Laura Forlano, a doctoral student at Columbia University and a member of NYCWireless.

[vi] These students include myself, Hanna Cho (WirelessToronto; MA 2006, Communication and Culture York and Ryerson Universities); Laura Forlano (NYCWireless; PhD 2008, Communications, Columbia University); Mark Gaved (DigCoop; PhD 2007, Communications, Open University); Katrina Jungnickel (Adelaide Wireless, Australia; PhD 2008, Visual Anthropology, Goldsmith's College UK); Dory Kornfeld (WirelessToronto; MA 2007, Geography, University of Toronto); Sascha Meinrath (CuWIN; PhD Communications University of Illinois Champaign-Urbana); Anthony Townsend (NYCWireless; PhD 2004, Urban Design, MIT); Matt Wong (Wireless Nomad; MSc 2007, Information Studies, University of Toronto).

[vii] These included a general education web site discussing network neutrality (http://www.whatisnetneutrality.ca) and an outline of types of local communication networks, prepared for Ethos Wireless (http://www.betterbroadband.org)