CARE AND THE CONSTRUCTION OF HACKER IDENTITIES, COMMUNITIES, AND SOCIETY

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This dissertation is dedicated to my family:

Terry, Kimberly, Colin, Dirk, and Ethan.

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Austin Lewis Toombs

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Recent scholarship in Human-Computer Interaction, science and technology studies, and design research has focused on hacker communities as sites of innovation and entrepreneurship, novel forms of education, and the democratization of technological production. However, hacking practices are more than new technical practices; they are also political, value-laden, and ideological practices. The significances of these underlying commitments is less understood not only in academic research, but also within the communities themselves, which tend to profess a libertarian ethos often articulated as apolitical.

In this dissertation, I investigate how the process of developing a hacker identity within a hacker community is influenced not only by technical skill, but also by care and community maintenance practices. By studying their projects, community interactions, and social policies, I explore how the broader hackerspace movement unintentionally but systematically excludes broader participation.

I leverage several qualitative methods to create a well-rounded account of the hacker identity development process, including: an interview study of hackers' projects; a 19-month ethnography in a hackerspace; and an analysis of the most-discussed issues on the international hackerspaces.org Discuss listserv. I analyzed these data through a lens informed by care ethics, foregrounding the interdependent, nurturing relationships hackers develop, and explicating the duties to care that are felt and acted on—but rarely discussed—in these spaces.

I present results suggesting that developing a hacker identity can be a vulnerable process, and is both supported and made difficult by the social environment in these communities. While critical to a hackerspace's success, care and maintenance practices are often overshadowed by rhetoric of self-empowerment and independence. As a result, it becomes difficult for women and

minorities to join and fit in, despite members' best intentions. These results have implications for research on hackerspaces, for hackerspaces themselves, and for analyses of care in such communities.

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CHAPTER 1: INTRODUCTION

Hacking and making practices, identities, and communities are increasingly of interest to human-computer interaction (HCI) and related fields, such as Science Technology and Society (STS), Computer Supported Cooperative Work (CSCW), and engineering. Researchers have recently argued that hacking practices and approaches represent the future of manufacturing (Mota, 2011) and entrepreneurship (Lindtner, Hertz, & Dourish, 2014). Even President Barack Obama, in February 2013, proclaimed that 3D printing—a technology approaching ubiquity thanks to hacker culture—has "the potential to revolutionize the way we make almost everything" (Gross, 2013). Researchers in this area have investigated the efficacy of hacking practices in Science, Technology, Engineering, and Mathematics (STEM) education (Mellis & Buechley, 2012; Kolko, Hope, Sattler, MacCorkle, & Sirjani, 2012), and scholars have studied communities of hackers to investigate the nature and scope of democratic participation (Tanenbaum, Williams, Desjardins, & Tanenbaum, 2013), empowerment (Grimme, Bardzell, & Bardzell, 2014), and identity development (Bardzell, Bardzell, & Toombs, 2014; Toombs, Bardzell, & Bardzell, 2014). Research in this area has grown quickly, and scholars have formed specific publication venues (e.g., the Journal of Peer Production and a CHI conference spotlight; Bardzell, Bardzell, DiSalvo, Light, & Rosner, 2014).

With few exceptions (e.g., Lindtner, 2012; DiSalvo, Gregg, & Lodato, 2014; Toombs, Bardzell, & Bardzell, 2015), however, researchers have tended to view hacking and making communities in a static manner, focusing primarily on documenting the practices of individual hackers rather than the emergence and sustainment of the communities in which these practices take shape. Because of this individualized focus, the extant body of research lacks the explanatory power to investigate how these communities succeed and thrive—success which I will argue is largely reliant on the everyday community maintenance practices of their members, and is influenced not only by the overt hacker rhetoric that surrounds these practices and groups, but also

by a tacit acknowledgement of the need to nurture the vulnerable identity-development processes that members go through.

In this dissertation, I contribute to the collective understanding of hacker communities by developing a rich, descriptive record of community maintenance and care practices as they occurred at *Null Alpha*, a small Midwestern United States town's hackerspace. I then contextualize these practices within hacker culture more broadly as it is discussed and negotiated in large-scale community email listservs. I develop this record through the documentation and analysis of social practices collected and analyzed using Carspecken's (1996) critical qualitative approach, sometimes referred to as a critical ethnographic approach. This approach is meta-theoretically grounded in Habermas' Theory of Communicative Action (TCA; 1984, 1987) and Giddens' theory of structuration (1979). This meta-theoretical understanding enables me to uncover the tacit norms reproduced in this community through an analysis of members' interactions with each other and with outside visitors. What I found in this long-term engagement and critical analysis is then situated within findings of an analysis of listserv discussions, in which members presented and engaged in argumentation regarding social and interpersonal issues faced by these kinds of communities.

To address the dominance of research focused on hacker practices in isolation from social and community norms, I analyze these community maintenance practices through a care ethics meta-theory I have synthesized from existing approaches to care ethics theory (Collins, 2015; Gilligan, 1982; Dennis, 2003; and Tronto, 1993) in a manner that is complementary to the critical meta-theoretical lens referenced above. I incorporate care ethics, specifically, because of the nurturing and identity-validating behaviors I observed taking place in the hackerspace, which seemed, on the surface, to contradict the overt ethos of independence within hacker culture. This care ethics approach allows me to: 1) explore the complex ethical situations that are embedded in hackerspaces, both through the participation modalities afforded by their collaborative

infrastructures as well as the individual identities that are shaped within them; 2) deconstruct the relationships among participants that are encouraged to develop through certain aspects of these communities' sociotechnical structures; and 3) address, from a moral perspective incorporating the methodological commitments of feminist HCI (Bardzell, 2010; Bardzell & Bardzell, 2011) and care ethics (Collins, 2015), the implications these relationships have on the inclusion and support of marginalized populations.

The focus within care ethics on particular contexts and the need to attend to individuals individually, rather than universally or impartially as through other ethical frameworks, helped foreground these nurturing relationships I observed precisely because they developed on a case-by-case basis. However, care ethics does not represent an all-encompassing approach, but rather a piece of the ethical puzzle; it can answer questions about how to care, but is less useful in situations where, perhaps, care should not take place. In my hackerspace studies, for example, I can talk about how participants engaged in nurturing behaviors, but not whether or not the hacker identity being nurtured is the most appropriate for that individual. Care ethics takes as given the desire or "important interest" (Collins, 2015) of an individual to become a hacker, but cannot account for situations where such an identity might actually be harmful. For those situations, alternative ethical frameworks are necessary, but outside of the scope of this dissertation. By framing community maintenance practices as collaborative care work, I am able to foreground the interrelatedness and dependency among participants in this community, providing insights into the formation and reproduction of the hacker ethos. This dissertation serves as a rare example of how care ethics literature can be used as a lens to deconstruct and explore interpersonal interactions in a technology-focused community, demonstrating the generative and explanatory power of using care ethics as part of empirically-based—and not only theoretical—inquiry (Collins, 2015).

Background of the problem

Hacking practices[1] include a range of activities often described as making, crafting, hacking, tinkering, repairing, or do-it-yourself (DIY), among others. Individuals who take part in these practices often identify themselves as hackers, makers, or crafters, grasping onto these practices as a way of describing who they are and what their place is in the world. Hackerspaces, makerspaces, and similar groups are communities centered around these practices and identities, whose members interact with each other either virtually through community websites and forums or physically in shared spaces. Hacker and maker *culture*, then, refers collectively to these practices, identities, and communities, as well as the attitudes, values, behaviors, norms, philosophies, and ethics reproduced through their enactment or continued participation.

In HCI and related fields of research, the scholarship of hacker culture is beginning to include concerns for the politics and motivations associated with participating in such communities. Current trends in this research include the study of: motivations for participating in online (e.g., Kuznetsov & Paulos, 2010; Lovell & Buechley, 2011; Rosner & Bean, 2009) and physical communities (e.g., Toombs et al., 2014; Kohtala & Bosqué, 2014); the collective political efforts of these communities (e.g., Tanenbaum et al., 2013; Lindtner et al., 2014); and the impact these collective practices may have on traditional economic systems (e.g., Mota, 2011; Lipson & Kurman, 2010). This focus on hacker communities in academia extends beyond HCI-related fields as well. In communication inquiry, Susan Sivek (2011) has investigated how *Make: Magazine*—the publication that claims to be at the core of the maker movement—appropriates hacker rhetoric as part of their branding strategy, which, perhaps unintentionally, results in a cooptation of hackers-as-individual-artisans. Media and communications scholar Alison Powell (2012) has discussed the role of

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[1] In this dissertation I will use "hackers," "hacking," and "hackerspaces," to also include "makers," "making," and "makerspaces," even though many participants in these communities refer to themselves as hackers or makers interchangeably. In Chapter 6, the discussion of the distinction between hackers and makers becomes more relevant, as it can sometimes be a point of contention among participants in these communities. Many of the findings and implications of this dissertation apply similarly to makerspaces and maker culture.

hardware hacking practices in helping to create a new, democratized ideal of citizens who can, through their hardware hacking experience, participate more fully in the continued democratization of knowledge through open source practices. Finally, anthropologist Gabriella Coleman (2012), through her ethnographies of various hackers—including individuals that the hackers I studied would call "crackers"—discusses the heterogeneity of hacker sociality, morality, and philosophy.

However, one need not look to academic literature to see how hacker culture is becoming popularized. Hacker practices are recognized as practical skills and hobbies, and are increasingly appearing as professional competencies in job descriptions and résumés. For the past few years, Etsy has solicited "hackers" (Careers at Etsy, n.d.) in their job descriptions, hoping to attract the attention of individuals who are comfortable taking things apart to join their product development teams or to help them build ad hoc in-house networks. Hacking practices, tools, and events are reported on regularly through popular news outlets, such as: CNN's coverage of hackerspaces in Iraq as a way to "save the country" (Hume, 2013); BBC's coverage as hackerspaces gained popularity globally (Knowles, 2010); and the New York Times' report on New York City's own prominent hackerspace, Noisebridge (Kurutz, 2013). Several organizations have also (sometimes notoriously) capitalized on the DIY rhetoric of hacker culture, notably O'Reilly Media and Make Magazine, but also Pinterest, YouTube (Gauntlet, 2011), and public libraries (nate, 2013). Through these examples it is clear that hacking practices and communities are increasingly of interest, not just to scholars within academic circles, but also for society at large. Lindtner et al. (2014) have described the need to understand these communities more deeply in terms of the effect they have on HCI research:

> "HCI is no longer simply happening in interaction-oriented research labs and HCI-centered academic programs, in user experience groups or at HCI conferences. It is also happening at emerging sites of technical invention - at hardware incubators, at hackathons, and in hackerspaces. […] Our work suggests that we need to understand the broader contexts within which these emerging sites of HCI innovation are embedded. […] Our research suggests that we need to see the hackerspace not just as a place that amortizes the cost of a laser cutter and a 3D printer across hundreds of people. It is a place where people are experimenting with new ideas about the relationships amongst corporations, designers, and

consumers."

Purpose of the Research

As popularized versions of hacking practices become more prevalent, their ideological, ethical, and philosophical underpinnings are shifted, co-opted, and tacitly reproduced. Two recent panels on "Making Cultures," one at CHI (Ames et al., 2014) and one at CSCW (Rosner et al., 2014), have addressed this increased incorporation of hacker practices into public discourse, highlighting the importance of critically interpreting the dominant rhetoric of hacker culture and questioning the reification of these practices, which inevitably either excludes or miss-labels certain practices. Through this increasing attention by scholars, the normative commitments that lie at the heart of these purportedly neoliberal libertarian hacker communities are coming under scrutiny, especially with regard to their impact as they are translated into new contexts. The following questions help exemplify these concerns. When hobbyists purchase a TV-B-Gone kit[2] from Mitch Altman, are they learning to be independent hackers and innovators, or are they learning the value of capitalizing on the inability of others to tinker on their own? When SparkFun, a leading manufacturer of hobbyist electronics, teaches children to solder in a booth at the World Maker Faire, are they teaching them a valuable skill or are they convincing parents to blindly purchase solder-able projects in the hopes that it is educational? When local hackerspaces involve participants in open source projects and take advantage of free resources online, are they aware of the inherent politics they are also communicating? These examples reveal relevant areas of investigation for current hacker practices, particularly in regard to the reproduction of hacker norms in community formation and maintenance.

Much of the research in this area has, until recently, described hackers as independent individuals, which is in line with the espoused neoliberal libertarian ideology that dominates hacker

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[2] TV-B-Gone is a small remote control that is easily built and can turn off the power to any public television. This device could be built from a few simple parts, but has nonetheless been transformed into an expensive kit by Mitch Altman.

culture rhetoric (Maxigas, 2012). I argue that in focusing on individuals and their practices, without also considering the sociality of these communities, the everyday, mundane maintenance practices required for such communities to function and persist are neglected. The resulting gap between how hackers talk about what it means to be a hacker, and how hackers actually participate in their communities and engage with each other interdependently is what I address in this dissertation.

Research Questions

This study addresses a specific gap in the current literature on hacker practices, identities, and communities, focusing on the underlying norms that are responsible for the maintenance of a hackerspace community over time and how those maintenance practices exist in a reflexive relationship with hacker culture as it is expressed as a global movement. Through this research, I address the following questions, each of which builds on the preceding question(s):

1. What community maintenance and care practices exist in a small Midwest US hackerspace?

2. How do participants' interactions relating to maintenance and care practices in this environment reproduce the community identity?

   a. How do these interactions express a specific kind of care, and how is this care communicated?

   b. How are these types of care reproduced through the community's system structures and functions?

3. How does care as it is expressed in this individual hackerspace relate to the "hacker ethic" of the broader hacker movement?

Scope and Contributions

I begin in Chapter 4 with a study of the identity development of hackers, and how those identities are tied to the projects hackers create and the skills they develop; I then demonstrate how both projects and skills relate to how hackers define themselves within their communities. This chapter draws from my earliest interest in care practices, as it seemed that the identity

development process in Null Alpha heavily relied on relationships with community members to mitigate inherent vulnerabilities. In Chapter 5, I identify, document, and reconstructively analyze (Carspecken, 1996) instances of community maintenance and care that I observed throughout my 19-month ethnography at Null Alpha. This analysis focuses on the forms of care that support community maintenance practices, which I then characterize by the functions through which these instances of care were enacted (Dennis, 2003), and the underlying system structures (Carspecken, 1996; Giddens, 1979) of the hackerspace community that enable these interactions to occur. In Chapter 6, I extend this analysis to a global listserv community in order to contextualize the caring mechanisms I observed in Null Alpha within the broader hacker movement and hacker culture. Finally, in Chapter 7, I synthesize the findings from all three chapters through a care ethics lens, focusing on the dependence relationships hackerspaces systemically support. In this chapter, I argue that hackerspaces, as collectives, successfully address one of their primary moral commitments, but fail to address their broader commitments to those who exist outside of their communities.

Through this dissertation, I contribute to the human computer interaction research field, care ethics literature, and to hackerspaces and hacker culture. I address a gap in HCI research on hackerspaces and hacking, arguing that certain aspects of hacker communities have been obscured or ignored, including how participants form and sustain identities as hackers, how they develop relationships with others who share these identities, and how the communities they form together support behaviors and social structures that appear to be explicitly apolitical and welcoming, but are, in fact, political, value-laden, ideological, and systematically exclusive. The methodological approach I demonstrate in this work of bridging an in depth analysis of a single community with a broader analysis of the "movement" in which that community exists could be modeled by other socio-technical researchers seeking to understand to what extent the behaviors they observed in their community of interest match (or do not match) the behaviors of the broader movement. The

care ethics perspectives that I synthesize and employ in this research demonstrate a uniquely

pragmatic and empirical application of care ethics within care ethics literature, demonstrating not

only that it can be done, but also how it is useful in teasing apart the tacit values that can be

shared by a community while simultaneously hidden by the dominant narrative. For hackerspaces

themselves, I propose a few ways forward in Chapter 8 to address the systemic exclusionary

practices that prevent hacking, as a movement, from being more welcoming to marginalized

populations.

CHAPTER 2: REVIEW OF LITERATURE

I begin this review of literature by briefly introducing the roots of contemporary hacker culture through various historical perspectives in order to contextualize the definitions I use in this dissertation to describe hacker practices, identities, communities, and culture. I then discuss the recent emergence of research on contemporary hacker culture, which has been discussed within a number of framings related to practices, identities, and communities. I focus on HCI related research, but include relevant literature from other fields as well. While this increased attention to hacker culture is important, I argue that certain aspects of hacker communities merit further investigation, including how participants pick up and adopt identities as hackers, how they develop relationships with others who share these identities, and how the communities they form together support behaviors and social structures that appear to be explicitly welcoming, but are, in fact, systematically exclusive. In the final section, I introduce the care ethics and critical perspectives I employ to address these gaps.

Histories of Hacking and Making

I refer here to multiple "histories" because what currently constitutes hacker culture draws on many seemingly disparate movements, including the Arts and Crafts movement of the late 19th century (Gauntlett, 2011), the DIY movement (Spencer, 2008; Turner, 2010; Anderson, 2012) and computer hacker clubs (Levy 2010; Coleman 2012) of the late 20th century, as well as the developments we see today, which make up the majority of this review.

Craft and Craftspersonship

Though the Arts and Crafts movement arose over a century ago, this period from the 1880s to 1910s is often cited as an influential predecessor to today's hacker movement (Gauntlett, 2011; Mota, 2011; Anderson, 2012). Ruskin's ideas about craft (Ruskin, 1904), promulgated by William Morris, a key intellectual driver for this movement (Gauntlett, 2011), have been built upon in more recent philosophical and epistemic explorations of craft and craftspersonship (McCullough, 1996;

Sennett, 2008). In *Abstracting Craft* (1996), Malcolm McCullough, professor of architecture and urban planning, discusses the relationship between craft, tools, and the changing nature of craft labor through industrialization and capitalism. He particularly notes the societal tensions that prompted Morris' Arts and Crafts movement:

> *"It is pertinent to recite this old story, for among the changes wrought by industrialization, none seems more significant than the abstraction of craft. From a technical standpoint the change was a twofold transformation in tools. First, the tools' motion became machine powered; their control became indirect; and they incorporated a greater conceptual component, which often surpassed the scale of the individual. Next the tools' very pace and position became governed by independent mechanisms (at which point they no longer fit our definition of tools). From a social standpoint, however, the change was more singular: the means of production had become too elaborate, too extensive, and too centralized to be owned and operated by an independent craftsman. This too was a consequence of abstraction: if time was money, then work was labor. This famous abstraction was a near-fatal blow to artisanry, for it quickly moved power from the traditional tool users to the innovative symbol users—financiers, engineers, and factory managers. This situation has been at the crux of critical theory ever since. Marx insisted that the replacement of human skill was more significant than the application of motive power. Veblen noted later that "Producer" had come to mean the owner of the industrial plant, rather than the workmen or the apparatus. Productivity became best measured in capital infrastructure per worker, as opposed to the skill of the individual worker. Under these conditions semiskilled workers were good enough. So in the face of new abstraction, traditional skills waned"* (McCullough, 1996, p. 70).

McCullough goes on to say that the modern version of the abstraction of people from tools and labor has arisen with the abstraction of information, and he argues for a critical treatment of the roles of information technologies and tools involved in this abstraction. He posits that people spend more time "learning about and tinkering with computers" and not enough time "setting goals or applying existing skills" (McCullough, 1996, p. 67). If this is true, then these are not "convivial tools"—or tools that help individuals impart their own meaning on the world (Illich, 1980)— because they require their users to invest energy in learning to *operate* them, rather than *direct* them, and therefore do not help their users independently evaluate or interact in a meaningful way with the world.

   The Craftsman (2008) by Richard Sennett, professor of sociology and humanities, traces discussions of craft and craftspersonship even further back to the first non-nomadic humans and

the ancient Greeks, for whom there was a strong connection between craft and community. He

defines craftsmanship as a "basic human impulse" that multiple practices depend on:

> *"'Craftsmanship' may suggest a way of life that waned with the advent of industrial society—but this is misleading. Craftsmanship names an enduring, basic human impulse, the desire to do a job well for its own sake. Craftsmanship cuts a far wider swath than skilled manual labor; it serves the computer programmer, the doctor, and the artist; parenting improves when it is practiced as a skilled craft, as does citizenship" (Sennett, 2008, p. 9).*

The notion of craft, for Sennett, is a productive framing for focusing the practice of improvable

skills. As machines replaced humans for this skilled labor, they obstructed the ability for humans to

practice these skills, and changed the role of craftspeople:

> *"As machine culture matured, the craftsman in the nineteenth century appeared ever less a mediator and ever more an enemy of the machine. Now, against the rigorous perfection of the machine, the craftsman became an emblem of human individuality, this emblem composed concretely by the positive value placed on variations, flaws, and irregularities in handwork" (Sennett, 2008, p. 84).*

In this way, craftspeople survived by becoming artisans, valued for exactly what was previously

most mundane about their work: the fact that it involved the use of human hands. Today,

craftsperson and artisan are virtually synonymous, and the term "maker" is beginning to mean

what "craftsperson" used to: someone who values the processes of making not just because they

value handwork in and of itself, but also because they value the role handwork plays in their

understanding of materials, concepts, and processes. At least among hackers and hackerspaces,

these connotations carry over to the word "hacker" as well, and define the set of relationships that

hackers encourage others to develop with their technologies and means of production.

The Do-It-Yourself (DIY) Movement

The DIY movement of the 1970s used a rhetorical approach that was similar to the Arts and

Crafts movement, encouraging a largely American audience to return to the acquisition of

individual skill and autonomy and the use of these skills. One of the primary differences here,

however, is that instead of guarding against the increasing use of machines in the workplace, this

movement critiqued the deskilling effects that the professionalization of certain types of labor had

on everyday individuals. In *Making is Connecting*, David Gauntlett, professor of Media, Art, and Design, explains the emergence of DIY culture in the United States through the self-efficacy and empowerment of the individual DIYer:

> *"We've got used to experts, professionals, and businesses telling us that the way to do things –whether building a wall, or learning about a subject, or getting entertainment – is to pay other people, who know what they're doing, to do the task for us, because we couldn't really manage it ourselves. DIY culture says that's rubbish: you can do it yourself, and you can do it with more creativity, character, and relevance than if you got a generic or 'expert' solution. And, importantly, it **feels good** to do it yourself: it's really good for self-esteem – a crucial dimension of personal psychology – whereas getting it done for you is disempowering, and often frustrating, and less meaningful" (Gauntlett, 2011, p. 56, emphasis in original).*

For Gauntlett, doing *anything* on one's own should be a universal capability—within a libertarian framing—and is intrinsically motivating (e.g., "empowering," and "feels good") and often pragmatic. However, for many members of the general populace during the late 20ᵗʰ century, DIY practices and attitudes were largely countercultural. Stewart Brand's Whole Earth Catalog (WEC) (Brand, 1968–1985) is often cited as the prime example of the countercultural trend in this era (Anderson, 2012; Gauntlett, 2011; Turner, 2010). The front cover of the WEC sets the utopic, self-empowered tone for this countercultural movement:

> *"We **are** as gods and might as well get good at it. So far, remotely done power and glory—as via government, big business, formal education, church—has succeeded to the point where gross defects obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing—power of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the WHOLE EARTH CATALOG." (Brand, 1970, emphasis in original)*

With a focus on communal or collective living and getting "back-to-the-land," this series of catalogs published descriptions and reviews of tools that would have been otherwise impossible to access at the time. In *From Counterculture to Cyberculture*, Fred Turner, associate professor of communication, connects Brand's influence with this countercultural movement to his later development of the Whole Earth 'Lectronic Link (WELL), which promised a digital utopian community separated from the influences of the "government, big business, formal education,

church" Brand referenced in the WEC (Turner, 2010). This early resistance is still visible in the publications and discourse of today's hacker movement (Ames et al., 2014; Tanenbaum et al., 2013; Maxigas, 2012).

Computer Hacking

Concurrent with the DIY movement of the 1970s was the emergence of computer hacker culture. American journalist Steven Levy (Medium, Wired, Newsweek) summarizes the history of hacker culture in *Hackers: Heroes of the Computer Revolution* (2010), which documents the rise of the earliest hackers in the late 1950s working and exploiting security vulnerabilities for their own personal gain from their basements to today's "hackers" who run multi-billion dollar companies based on their tinkerings (e.g. Steve Jobs' Apple and Mark Zuckerberg's Facebook). Throughout this account, he discusses the espoused politics and ethics of hacker culture, whose norms and practices led to the modern open source movement (Powell, 2012) that many hackerspaces and similar communities of makers continue to promulgate. In discussing these hacker culture ethics, ideologies, and philosophies as a singular ethic that guides the modern hacker and maker movements, some scholars have participated in what Coleman (2012) and Maxigas (2012) criticize as a "whitewashing" or "confounding" of the specific historical genealogies that these diverse cultures have contributed. This conflation is carried on through hacker communities as participants read and interpret the journalistic or corporate promotional accounts Coleman and Maxigas criticize, further complicating the relationship between espoused hacker identities and the identities that hacker communities actually support (i.e., espoused v. theory in use; see Argyris & Schön, 1974).

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Emergence of Research on Contemporary Hacker Culture

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Modern hacker culture—birthed from these three complementary movements—has risen in prominence on a national and international level, and following this popularity in the public sphere, has also become a profitable area for research communities across a number of disciplines,

including HCI, communication, journalism, media studies, sociology, STS, education, and engineering. This rapid increase in attention has led to contradictory accounts of "hacker culture," and even more conflicting advice about what these research communities should be doing to better-understand it.

In the following sections, *hacker culture* refers to the shared meaning of participating in the practices and communities of hackers and makers, as well as the attitudes, values, behaviors, norms, philosophies, and ethics reproduced through their enactment. I am intentionally inclusive when using the term "hacker"—describing a variety of activities often called making, crafting, hacking, tinkering, repairing, or DIY—with the understanding that this inclusivity risks mislabeling some communities that may not adopt the hacker label for themselves. I intentionally choose this risk over the risk of leaving out practices that are often neglected by canonical hacker culture for being too feminine, non-technical, or outside of middle class and libertarian values.

Hackerspaces and similar communities of making have been attracting increasing attention in multiple academic fields, public discourse, entrepreneurship, and government and civic involvement. But while interest in these communities of making is growing, the lack of a common vocabulary to describe hacker practices, identities, and communities hampers the ability of researchers to engage in transdisciplinary conversations about the political and civic impact of hacker culture. In the following sections, I will outline these conceptual structures that describe and explain hacker culture, grounding this discussion in theories that have emerged about hacking and making.

Hacker Practices

Hacker practices describe the activities individuals participate in while making, hacking, tinkering, repairing, crafting, etc., in both professional and leisure settings. Research on these practices often focuses on the broader impacts of participation, and the cultural or sociological motivations individuals might have for engaging in hacker practices. Hacker practices can be

productively viewed through two perspectives: 1) the democratization of technological practices, enabling everyday individuals to engage in practices that were previously reserved for professionals and the elite; and 2) the growing awareness of these practices within the public sphere, particularly through the implementation of educational technologies in the K-12 educational system and hobby and leisure activities.

Democratization of Manufacturing

Hacking practices have had a dramatic impact on the democratization of manufacturing techniques in the past decade, extending the DIY and back-to-the-ground rhetoric of previous movements to more modern technologies such as 3D printers, laser cutters, and other means of digitally-enabled physical production. Mota investigated the practices that were being appropriated from industrialized, professional practice by everyday individuals, taking a broad look at "a trend that promises to revolutionize the means of design, production and distribution of material goods and give rise to a new class of creators and producers," which she paralleled with the Arts and Crafts movement a century ago (2011). Her work speculates on the future of the DIY and hacker movements, with specific attention to intellectual property, sustainability, and safety and environmental quality regulations. Several other authors have speculated on the economic impacts and revolutionary effects of the modern hacker movement, including President of the United States, Barack Obama, in his 2013 State of the Union speech (Gross, 2013), Chris Anderson (2012), Neil Gershenfeld (2008), and Lipson & Kurman (2010). Critical interpretations of the democratization of these technologies has included Jackson's and Kang's questions of the impacts they have on environmental sustainability (2014), as well as media and communications scholar Alison Powell's discussion of the role of hardware hacking practices in helping to create a new ideal of citizens who can, through their hardware hacking experience, participate better in the continued democratization of knowledge through open source practices (2012).

Beyond Counter-Culture Discourse

Concurrent with the increased accessibility of manufacturing practices, the public's awareness of these practices have rapidly expanded, including an understanding and adoption of hacking practices in everyday life. This increased awareness and comfort in the public sphere has resulted in a shift in the acceptability of what were previously sub- or counter-culture practices and discourses as hacker movement practices extend into our daily lives, such as the call for hacker–related skills appearing in résumés and job descriptions at Etsy (see Chapter 1 for other examples).

In some instances, hacker practices are being exported to the public in the name of academic research, through the incorporation of hacking activities in early childhood education. These interventions operate with varying assumptions of the impact of hacker culture rhetoric, ranging from blind adoption of seemingly benign practices as a panacea to US educational system issues and the acquisition of 21st century skills (e.g. Buechley & Hill, 2010; Mellis & Buechley, 2012; Kolko et al., 2012), to, recently, more nuanced understandings of hacker culture's implication in some of these same systemic issues (Buechley, 2014).

Hacker practices are also making their way into public discourse through related hobbies and leisure activities, which scholars have primarily investigated through analyses of motivations participants have for engaging in these practices, as well as identities that are associated with these practices. Tanenbaum et al. (2013) explore the relationship between the democratization of technological production, which sometimes forms the basic motivation for participating in a hackerspace, and the hedonization of that same technological production. Similar work through this leisure activity framing also begins to address how individuals develop specific identities through engaging with these practices and how those identities are tied to feelings of empowerment (e.g. Akah & Bardzell, 2010; Grimme, 2014).

Hacker Identities

Complementing this research on hacker practices is an interest in the particular identities, subjectivities, or standpoints hacker culture supports, which includes a discussion of the felt life of hackers (Ducheneaut, 2005; Lindtner, 2012; Coleman, 2012; Bassett, 2013; Tanenbaum et al., 2013; Kohtala & Bosqué, 2014; Bardzell et al., 2014; Toombs et al., 2014; Toombs et al., 2015). Two primary framings of this research include: broad discussions of hackers as part of an overall reconceptualization of what it means to design for a "user," for HCI research and industrial practitioners alike (Roedl, Bardzell, & Bardzell, 2015) and the treatment of "the hacker" as an identity in its own right (e.g., Tanenbaum et al., 2013; Sivek, 2011).

Hackers as Experts and Everyday Designers

Discussing hackers as experts and everyday designers can be seen as part of a push to reinterpret HCI's monolithic notion of the "user" from a dependent consumer to an individual with creative agency. Kuznetsov and Paulos (2010) present DIY practitioners as "expert amateurs" who are a source of interaction design with the potential to influence the HCI community. Exploring the "impact of information technology on do-it-yourself culture, design, and HCI" through the lenses of creativity and identity, Rosner and Bean (2009) cite the performance of collaborative values as an integral part of participation in an online community of IKEA hackers. Similarly, Wakkary and Maestri (2007, 2008) describe individuals who manipulate their home environments in an ad hoc way as "everyday designers" who actively shape their world, whose acts of everyday design should be designed for by the HCI community.

Speaking more on the community-level, rather than the individual hacker level, namely within the context of open source communities, Fischer and Scharff (2000) call for products that enable individuals to act as designers, presenting the designer role as one to which everyone should have access. They use participation in these spaces as exemplary of the user-as-designer, and specifically call out the difference between this "designer mindset" with the negative "consumer

mindset": "To create designer mindsets, one of the major roles for new media and new technologies is not to deliver predigested information to individuals, but to provide the opportunity and resources for social debate, discussion, and collaborative knowledge construction" (2000, p. 2). These and other scholars argue that interaction design should provide more opportunities for appropriation, design, or similar types of agency in order to enable user creativity, innovation, and home maintenance. They argue that adjusting the way HCI research has traditionally treated its users can do this.

"The Hacker" as its Own Identity

The identity related work in the previous section represents a more objectivated use of hacker culture, whereby scholars use hacker culture rhetoric of creativity and self-empowerment to reframe research constructs (e.g. "the user"). Complementing this is a body of work that discusses "the hacker" as an identity in its own right; one toward which individuals and communities intentionally strive, and one that is targeted by corporate branding strategies. Tanenbaum et al. (2013) call for work in HCI that more directly supports the felt creativity of hacking. Kohtala and Bosqué (2014) discuss the particularities of MIT Fablab Norway, highlighting that that fablab community (as with every other hacker community) has been uniquely defined not only by its history, but also by the personalities involved in its continued maintenance. In more critical work, Sivek examines the branding and marketing strategies used by Make Magazine to cultivate a collective identity among its readers to further sell its media products "through the use of key themes of American ideology and even nationalism, while also motivating individual readers to participate in the 'making' project for personal fulfillment and self-actualization" (2011). Sivek asks if this process of turning making into a branding strategy possibly "diminishes or removes [making's] potential as a critical act" by turning its participants into simply "one of a branded, imagined community, feeling that he or she is acting against the powers that be, but in fact often simply acting in just the kind of small ways that don't threaten those powers" (2011). A contrasting

example of this is the opening of Iraq's first hackerspace, which several sources (Ackerman, 2012; Hume, 2013) have speculated could drastically change the civic environment:

> "…an Iraqi-American who's trying to create the country's first hackerspace believes it'll take 'irrational optimism' for Iraqis to remember they were among the planet's first maker cultures. …Ghalib…holds out hope that the hackerspace will rekindle the entrepreneurial spirit that once defined Iraq, which used to churn out the majority of the Mideast's engineers. 'The culture ties us not only to each other but to our common ancestry,' Ghalib enthuses. 'It ties back to the days before sectarianism—an innovative, collaborative culture, a hub of science, technology and philosophy" (Ackerman, 2012).

Coleman has similarly documented the civic entanglement hackers express in defining their identities:

> "The language hackers and geeks frequently invoke to describe themselves or formulate political claims includes words and expressions like freedom, free speech, privacy, the individual, and meritocracy. This tendency is revealing in that many hackers and geeks unmistakably embrace liberal visions and sensibilities. 'We believe in freedom of speech, the right to explore and learn by doing,' and, explains one hacker editorial, 'the tremendous power of the individual.' Since the commitments of hackers and geeks are not entirely of their own making, the liberally rooted political messages they herald should be familiar to most readers" (Coleman, 2011).

Participation in Hacker Communities and Movements

Much of the literature on hacker culture includes a discussion of the motivations individuals have for participating in these communities or participating in hacker practices external to a community. In this section, I summarize four themes of participation I have documented based on an analysis of literature on hacker culture and related movements: information sharing, cooperative work and peer production, entrepreneurship, and civic engagement. It is important to discuss these participation motivations in this context because it is through these performances of hacker practices and identities that hacker values and ideologies are reproduced.

Information Sharing

The discussion of information sharing in the context of hacker communities is approached from two angles in research on these groups: 1) as a motivation for participating in these communities based on a desire for access to knowledge that is shared (e.g. specific skills and discussion of best practices); and 2) as a unique characteristic of these communities, noting that

hacker communities produce knowledge in ways that are different than other communities due to their shared values.

In a large-scale study of DIY communities, Kuznetsov and Paulos (2010) propose that open sharing, learning, and creativity are more powerful motivations and values for their participants than profit and social capital. They link this to the espoused political ideologies of these communities, namely the goal of working toward an anti-consumerist movement and the resulting higher status placed on values of open information sharing and learning. In speculating on the future of the open hardware movement, based on an understanding of open software communities, Powell (2012) presents a thorough examination of the linkage between the ideologies of early hacker culture coming out of MIT and the philosophies, histories, and identities of the open hardware movement. She argues that these intersecting spaces of open information sharing,

> *"introduce opportunities to develop new forms of technological citizenship, based on better knowledge about how things work and increased abilities to take apart, repair and reconstruct the devices that increasingly mediate and facilitate our communications. This establishes a new set of opportunities for democratization of knowledge, which are exemplified by the several different forms of open source hardware" (Powell, 2012, p. 705).*

Examples of such information and project sharing communities that exist today—and are often studied in HCI literature—include: LilyPond, an online community for sharing e-textile projects developed by Lovell and Buechley (2011); MIT's Scratch, a platform enabling children learning to program to remix and appropriate programming projects built by other children; Instructables, a large-scale tutorial-based website much like Scratch but for a wider variety of DIY projects catering adults; Stack Overflow, a programmer-specific website for sharing answers to programming problems, ranging from incredibly complex to commonly encountered; and many other communities with less of a technological focus such as Ravelry, Deviant Art, and fan fiction writing groups.

These values of open sharing are often freely expressed within hacker communities, but quickly expand into gray areas regarding the legal sharing of copyrighted media. Since these values are supported and reproduced on both the community and practice level through day-to-day activities, new members who may or may not fully grasp their consequences quickly pick them up. Juxtaposing this with current trends to bring hacker culture into multiple aspects of education helps us see how this could have unintended secondary consequences.

Peer Production and Cooperative Work

The discussion of peer production and cooperative work in the context of hacker culture applies to several contexts: open source software development communities; hackathons and similar events; citizen science projects or initiatives; and hackerspaces and similar collaborative work environments.

In their research on re-imagining the user as a more empowered individual who has the capability to design for herself, Fischer and Scharff (2000) referred to the open source software development community as an ideal community of participating "meta-designers," except that the barrier to entry is too high for non-programmers. With this example, they speak to the ideal of creating systems that anyone and everyone can participate in. In her work comparing the open source software community to an emerging open source hardware community, Powell directly links ideals of citizenship to participation (quoted earlier) (2012). Balancing these voices, speakers on the CHI 2014 panel on Making Cultures criticized these same open source communities for using the "open source" label as a more acceptable form of "free labor" (Ames et al., 2014).

A similar discussion of community and collaboration can be seen in work on more traditional peer production craft discipline workshops, such as woodworking shops. Sennett, citing Harper, posits that such shops risk being unable to pass on their tacit knowledge (in this case skills and practices but I would also extend this to values and ethics) unless the lead craftspersons are able to fulfill the role of the sociable expert, one who is "comfortable with mentoring" (Sennett,

2008; Harper, 1987). Sennett distinguishes between corporations and communities that succeed

through cooperation and share "that experimental mark of technological craftsmanship, the

intimate, fluid join between problem solving and problem finding," like the Linux community, with

those that try to succeed through competition in which "clear standards of achievement and

closure are needed to measure performance and to dole out rewards." (Sennett, pp. 33).

Hackerspaces and similar communities can sometimes operate in a liminal space between a

corporation and a community, especially once they reach the stage of filing for 501(c)(3), or non-

profit, status, and thus rely on a balance between these two extremes. In Chapter 7, I discuss how

the balance between these extremes can impact the ethical decision making strategies of such

communities.

Future of Entrepreneurship

Another body of research on hacker culture engages with the changing role of hacker

communities in entrepreneurship and startup culture. Several successful companies have their roots

in hackerspaces or similar communities, including: Makerbot, the company responsible for the

increased attention in 3D printers as domestic machines, which has developed a complicated

relationship with open source communities as it has undergone several changes to its licensing

agreements (Anderson, 2012); the Pebble ePaper Watch, which benefited from the highest amount

of money ever raised in a Kickstarter campaign (Lindtner et al., 2014); and other newer startups

that can be seen throughout Kickstarter and similar crowd funding sites. Much smaller startup

companies are a common sight for many of the more prominent hackerspaces in large cities on the

coasts. At Maker Faire New York in 2013, as well as various non-branded maker conventions, I

have interviewed several such startups who were selling their wares—often small circuit board

hacks turned into retro style games, jewelry, or kits—and claiming connections to local

hackerspaces. In a recent paper at CHI 2014, Lindtner et al. describe this trend of hackerspaces

becoming tech incubators and places that are engaging in and producing innovative HCI based on

HCI's visions of the future as a fourth iteration, or "wave," of the role of hackerspaces in public life (2014). They argue that HCI researchers should engage with maker culture by developing "a repertoire of deep engagement and critical reflectiveness toward technological design," as a way to balance the rhetoric about maker culture coming from government and industry sources. While I agree that this focus on the professionalization of hackerspaces is important and relevant, I argue that we need to pay attention to the community aspects of hacking contexts as well, extending the focus on material and physical outcomes to also include *human*-developmental outcomes.

Centers for Civic Engagement

As scholarship begins to address the plurality of hacker practices and contexts, it has also turned to focus on their broader political, ethical, and ideological implications. Hackers and makers are developing public-facing identities, and their involvements with maker communities, with hacker events like hackathons, and with spreading the "gospel" of the hacker movement within their local communities, are increasingly focused on making civic arguments and presenting civic-minded motivations for participating. There are three ways this civic engagement takes shape: on the hackerspace-as-its-own-community level; on the local level, involving the town or city in which the hackerspace is geographically located; and on a broader, global community level most often associated with the term "movement."

Internal Communities. Complementing the view of hackerspaces as sites of innovation and the future of industrial HCI design discussed in the previous section is a strand of research that focuses on the sociality of hackerspaces and the role they play as community centers for their members. In our CHI 2014 note, Jeffrey Bardzell, Shaowen Bardzell, and I investigated the practice of tool-making and the roles that self-made tools play in the artifact ecology of a particular hackerspace in order to unpack the hacker identities and skills promoted by that community (2014). Kohtala and Bosqué (2014) discuss the sociality of a similar community, in this case a FabLab. They focus specifically on the relationship (or tension) between the MIT-fablab in Norway

and the broader system of FabLabs as a "brand" defined by Neil Gershenfeld. This work characterizes the personalities involved in MIT fablab Norway's creation, the tensions of building that community almost in opposition to the initial wishes of the MIT FabLab program, and the role that this physical space plays in the broader community in which it is contextualized.

MIT fablab Norway and the hackerspace at the center of my research survive in part because they operate as a kind of "third place" (Oldenburg, 1989) for their broader communities. The concept of the "third place" is one that is often adopted by hackerspace members themselves as a motivation for joining and participating in the hacking community. The hackerspace offers members a place where they can break out of the roles that define them in their home and work contexts, and allows them to have a sociability that they often describe as important to their own health. It describes any community, group, or space that provides a social outlet that is separate from work and home. Oldenburg posits that the diminishment of these third places is contributing to the "downfall of American society," and proposes that re-emphasizing their importance and their role in developing model citizens could be a solution to this problem (1989).

External Local Communities. The external local community refers to the neighborhood, town, or city in which the hackerspace in question is situated. Scholars in HCI have begun discussing the relationship between civic engagement and maker culture. Drawing on theories of civic engagement based on Latour's notion of "matters of concern," DiSalvo et al. consider "the role of design in contributing to the formation of publics and discuss an emerging orientation to publics in HCI design" (DiSalvo, Lukens, Lodato, Jenkins, & Kim, 2014). They connect design to this notion of matters of concern through reflective, critical, and speculative designs. In related works, DiSalvo and his colleagues have used participatory design projects and hackathon-like events to explore how making can be a way to both get people to think about their place in their communities as well as envision more effective ways to participate civically (DiSalvo, Nourbakhsh, Holstius, Akin, and Louw, 2008). In my own field work, I have seen how volunteers at Null Alpha

develop an identity of civic engagement with their larger community, through organizing workshops to teach children various maker-skills to funding maker conventions through generous donations in order to create an event for the community to enjoy.

External Global Communities. The United States government, on a national level and on the individual state level in some cases, has recently been demonstrating interest in aspects of the hacker movement. President Barack Obama's quote about 3D printing came after the US Office of Science and Technology Policy (OSTP) commissioned a report, published in 2010, that "…outlines the emergence of personal manufacturing technologies, describes their potential economic and social benefits, and recommends programs the government should consider to realize this potential" (Lipson & Kurman, 2010). Since then, the white house has organized several hackathons, both as part of another initiative from the OSTP, the National Day of Civic Hacking, as well as an Open Data Day. On the local level, advocates for the open data movement in Minneapolis and St. Paul have put together a rapidly growing community called the Open Twin Cities network[3], which has been well-received by the local government and has organized several events attended by the city's mayor.

These events and this level of involvement from the US government show marked changes in how hacking and making are perceived. However, this government involvement is not universally welcome in hacker communities. For example, O'Reilly Media's acceptance of DARPA (Defense Advanced Research Projects Agency) funding led to considerable controversy among hacker culture's prominent celebrities, such as Mitch Altman[4]. Based on her ethnography in China, Lindtner et al. (2014) explored how making and hacking practices there function on a civic level, fitting into a larger goal of changing the "maker identity" of China as a manufacturing hub; one where products are not just made in China but created there. In her other work, she discusses how this citizen- and maker-led vision of China intersects with the visions Chinese politicians hope to act

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[3] http://opentwincities.org
[4] http://makezine.com/2012/04/04/makerspaces-in-education-and-darpa/

upon to develop a more creative and innovative nation (2012). Lindtner works to "debunk two common myths: first, that maker culture is inherently apolitical, and second, that innovation is limited to so-called post-industrial or developed regions functioning on the principle that wealth production comes from 'ideas, knowledge, skills, talent and creativity.'" Her dissertation takes seriously the roles that making, creativity, and maker cultures play in developing citizens and in creating "new worlds." Tanenbaum et al.'s work engages more critically with a similar line of thought, discussing the scope of democratic participation that is accessible to hobbyist makers (2013).

When viewed as a continuation of the arts and crafts or DIY movements, maker practices are easily characterized as having "a gentle revolutionary dimension" (Gauntlett pg. 56). Betsy Greer refers to this as "craftivism," in which choosing to create something rather than buy it involves an inherent political choice, or a resistance (2008). HCI scholars have also discussed this non-violent resistance aspect of hacker practices. Tanenbaum et al. (2012, 2013) discuss the changing role of DIY hobbyists, describing their potential impacts first as speculative agents with the potential for social change, and second as leaders in a movement to democratize manufacturing processes. Maxigas (2012) separates the ideological genealogies of hacklabs and hackerspaces, which he argues have been unintentionally equated in both current academic and public discourse, thereby undermining the ability of researchers to understand the ideological development of either community on a deep level. Where hackerspaces might not define themselves as political (even though they usually are), hacklabs are intentionally and overtly political. Maxigas suggests that conflating these two genealogies minimizes the effects of the critical, activist efforts of hacklabs, historically.

These three levels—the internal community, the external local community, and the external global community—offer a unique frame for discussing care as a particular entry to civic engagement for maker communities. The primary focus of this dissertation is on the internal

community level of enacted care, which I access through documenting and analyzing community maintenance practices. In answering R3, I begin to discuss the external local community and external global community levels of enacted care, but future work will be needed to address this level further.

Care Ethics in the Critical Tradition

Common through most of the work I have presented so far is an engagement with the plurality of hacker contexts and identities, and how these intersect with other aspects of life (e.g., politics, community maintenance, and personal empowerment). Hacking can be seen as an empowering practice, but it can also be seen as a class barrier, representing a privileged hobby to which only certain individuals have access. The process of becoming a hacker can represent a striving towards independence, but the acquisition of making prowess is also quickly becoming commodified by industries who hope to turn it into an expensive—and addicting—hobby. Many proponents boast of the "powers" of hacking to motivate individuals to become citizen scientists in some countries, while at the same time there is a looming fear of what governments will do when they step in and attempt to regulate these activities. Nuances and contradictions such as these are at the heart of hacking cultures, and I use them to frame the questions, methods, and perspectives I employ in my research. I recognize and acknowledge the inherent complexity of hacking and the identities one performs through this process—as well as the reproduction of these hacker culture norms—by engaging hacker culture through a synthesis of care ethics and critical theory perspectives. These perspectives provide a rich understanding of the roles and subjectivities through which individuals interact and relate, as well as the normative infrastructures in which these interactions and relationships occur. In this dissertation, I present an empirically-based account of care practices, attitudes, and ethics which is unusual for this tradition of scholarship.

Care Ethics Background

Care ethics encompasses a broad set of theoretical and philosophical literature on care. Care ethics is a moral philosophy that developed within feminist theory and engages with the ethical, moral, and value implications of care; this concept was introduced to the study of ethics through a series of debates now known as the Kohlberg-Gilligan controversy (Gilligan, 1977; Tronto, 1993; Hamington, 2009, Noddings, 1982). Kohlberg's theory of moral development claimed to demonstrate a lower capacity of morality in women, which Gilligan instead attributed to a reliance on a male-biased perspective of ethical behavior. Care ethics is occasionally positioned as an alternative to consequentialist and deontological ethical theories, which attempt to characterize the morality of an action based on that action's outcomes or the degree to which that action obeys a set of pre-established rules, respectively. Where care ethics differs is in its focus on the particular contexts, narratives, or interdependent relationships between the individuals implicated in a given interaction. Care ethics has previously been used as: an epistemological approach to ethics that focuses on the interdependence between people (Gilligan, 1982; Noddings, 1982) and the moral duties that result from those dependency relationships (Collins, 2015); a feminist contribution to moral philosophy (Benhabib, 1992); and speculation on what a socialized theory of care would look like (Hamington & Miller, 2006). As care ethics literature is disseminated into HCI and related fields, it is often used to characterize the responsibility of designers (e.g., Light & Akama, 2014), who are increasingly creating the means through which we enact our sociality as interdependent beings in specific contexts. However, care ethics lacks a methodological history or a set of empirically-grounded analytic tools, which I account for through my inclusion of Dennis' typology of care-in-action (2003), described in Chapter 3.

I have explained previously that I rely on care ethics as an alternative interpretive lens through which I engage with my data. More concretely, care ethics scholars have developed several definitions and sets of characteristics of care that I draw on in my analysis and in framing my

research interests in interdependence and care labor, including most prominently Joan Tronto's

phases of care (1993, 2006) and Stephanie Collins' dependency principle (2015). Tronto maps her

four phases of care to four sub-elements of care, which include "caring about" (attentiveness),

"taking care of" (responsibility), "care-giving" (competence), and "care-receiving"

(responsiveness). She defines care in her work as:

> "…a species activity that includes everything that we do to maintain, continue, and repair our 'world' so that we can live in it as well as possible. That world includes our bodies, our selves, and our environment, all of which we seek to interweave in a complex, life-sustaining web." (Fisher & Tronto, 1990).

For Fisher and Tronto (1990), care is an important and universal aspect of everyday life. Tronto and

other authors expand on this "complex, life-sustaining web" to discuss how care ethics intersects

with ideals of citizenship—as a form of participation with the larger community—and identity

within a social group, in which humans are inherently interdependent beings (e.g., Sevenhuijsen,

Bozalek, Gouws, & Minnaar-Mcdonald, 2006). In *Moral Boundaries*, Joan Tronto (1993) describes

the significant implications an ethic of care can have when taken seriously as a political standpoint.

Tronto (1993) describes this ethic of care as a practice, rather than as simply a set of rules or

principles. She presents an historical account of the relationship between morality and politics, and

proposes the place for care in this relationship. Tronto (1993) advocates for an interpretation of

humans as interdependent beings, a notion that both my own work on social community

membership benefits from, as well as HCI's current (and limited) conceptualization of "the user."

Further, in a chapter of *Socializing Care*, Tronto (2006) discusses several imbalances in our

conceptualizations of care, including: the contextual limitations on one's capacity to care, the

power relations inherent in care practices, and the relative lack of attention researchers give to care

recipients as opposed to care givers. In linking care to a public conception of citizenship, she

proposes "that if unequal opportunity poses a threat to democratic society, then democratic

citizens have to take seriously a collective commitment to care" (Tronto, 2006, p. 5).

Building on, resituating, and critiquing Tronto's work, Stephanie Collins (2015) has

proposed the concept of a *dependency principle*, which she defines as the core normative

commitment of care ethics. Collins' (2015) book, *The Core of Care Ethics:*

> *"aims to provide a new synthesis of the normative commitments that have emerged, over the last thirty years, as being central to care ethics…Although the slogan of care ethics remains elusive, most care ethicists agree that relationships – between caregivers, care recipients, supporters of caregivers, and caregiving institutions – lie somewhere near the normative heart of the theory" (2015, p 1).*

This "slogan," which she also characterizes as a "principle," is: "dependency relationships generate

responsibilities." Collins (2015) argues that there needs to be a balance within care ethics literature

between the creation of generalizable principles, which are often argued against but she

demonstrates as reasonably important, and the need to act solely in accordance to particulars. The

latter focus on particulars is often the proposal of care ethicists, but Collins argues that this

approach alone does not provide sufficient actionable recourse. She first states the four key

normative claims of care ethics, and then demonstrates how her dependency principle addresses

each of these four claims. The dependency principle is described at length in the book, but is briefly

explained as follows:

> *"…this principle can be understood as asserting that a moral agent, A, has a responsibility when three conditions are met: (1) moral person B has an important interest that is unfulfilled; (2) A is sufficiently capable of fulfilling that interest; and (3) A's most efficacious measure for fulfilling the interest will not be too costly. A incurs an even more weighty responsibility if (1) to (3) are true and (4) is also true: (4) A's most efficacious measure for fulfilling the interest will be the least costly of anyone's most efficacious measure for fulfilling B's interest."*

In later chapters, she goes on to explain "how this principle can produce responsibilities for groups,

from small-scale informal groups to nation-states." (Collins, 2015, p 12).

Perhaps what is most unique to Collins' argument is how she emphasizes the moral and

ethical duty of collectives that exist in between the level of the individual and the level of the state,

and that these collectives can and do engage in moral or ethical behavior and attitudes by

distributing these attitudes and actions among members.

"When a group agent has a pro tanto duty to see to it that X (where X might, for example, be that the group takes a measure to fulfil an important interest), then each member has a pro tanto duty to act (if necessary) in accordance with their role to put inputs into the group's decision-making procedure with a view to the procedure's distributing roles to members in a way that: if enough members acted within their roles with a view to seeing to it that X, then that would be sufficient for X in a high proportion of likely futures. Once these X-sufficient roles are distributed, then each member has a pro tanto duty to act in accordance with their role with a view to seeing to it that X.
[…]
How does this work for dependency duties in particular? If the collective is well-placed or best-placed to fulfil an important interest and its members are not, then the collective can have a dependency duty while its members (taken individually) do not. This is likely to happen, because the presence of a group decision-making procedure will often mean that the group agent has a capacity to do something that no member can, or can do that thing at lower cost than any member can. If no member alone is best-placed or well-placed, then none alone can have a dependency duty. But if the collective decides to aim to perform the action of 'taking measures to fill this important interest,' and if the collective meets the other conditions for dependency duties, then the duty to fulfil the important interest is held by the collective. This collective duty can then [be] distributed out to individuals, in the form of more specific individual duties to do what they can within their role for the collective to take that action. Group's dependency duties—and…care ethical duties—are thus made up of the duties of individuals." (Collins, 2015, p 130-131).

Related Concerns in HCI

Care ethics has not yet been discussed in HCI in a significant way, but this perspective is beginning to be used in related fields, such as STS (Puig de la Bellacasa, 2011, 2012) and participatory design (Light & Akama, 2014). However, the epistemological commitments of feminist HCI provide a way for a care ethics approach to be developed for HCI research by outlining qualities of feminist interaction in the context of HCI, which include: pluralism, participation, advocacy, ecology, embodiment, and self-disclosure (Bardzell, 2010). The epistemological and methodological commitments outlined in feminist HCI literature shape how I make use of care ethics to engage with problems of the "marginal user." The quality of pluralism, in particular, is important to the inclusion of care ethics perspectives in HCI in that it "rejects the claims to universalism not on dogmatic terms, but because of the practical benefits of such an understanding. Pluralist designs are likely to be more human-centered than universalizing designs simply because 'human' is too rich, too diverse, and too complex a category to bear a universal solution" (Bardzell, 2010).

Additionally, Bardzell and Bardzell (2011) propose an HCI methodology that builds on feminist theory, outlining several key methodological positions, including characteristics such as reflexivity, empathic relationships with research participants, and the co-construction of core research activities and goals with participants. They also outline commitments that are common to feminist research, including the "categorical rejection of the notion that science is value-free," a commitment "to empirical accounts of human experience," and a commitment to gender. Bardzell and Bardzell (2011) argue that these commitments, and their basis in feminist theory, challenge structures that have traditionally overlooked "two vital aspects of human life that are traditionally assigned to women: the care of our bodies and emotional labor" and present a "simultaneous commitment to scientific and moral objectives".

Another area of related work can be found in Community Informatics research on capacity building, which is defined as the "increase in community groups' abilities to define, assess, analyse and act on health (or any other) concerns of importance to their members" (Peddle, Powell, & Shade, 2008). Peddle, Powell, & Shade (2008) argue that capacity building is "acknowledged and supported at the theoretical level" but that "in practice capacity building often involves caring work that is typically undervalued" and difficult to support because the outputs "are often social in nature," but "demands are placed on [Community Informatics] organizations to provide quantitative results of their work." In hackerspaces, this undervaluing of care work presents a Catch-22, which I address in Chapter 7, where the kind of emotional and care labor required to create welcoming atmospheres for hackerspaces is traditionally done by exactly the kind of people who are currently underrepresented in these spaces.

In the past year, recent scholarship has emerged that ties these feminist concerns with research on hackerspaces. In particular, Fox, Ulgado, & Rosner (2015) have explored how feminist hackerspaces have sought to "support women's creative and professional pursuits" while pushing back on the definitions often found for what constitutes hacking and what is left out. Fox et al.

(2015) argue that the primary concern, though, is not about who is and who is not included, but who is and who is not *visible* in these contexts.

In Chapter 6 and 7 I demonstrate how the duties that hackerspaces take on, as collectives, are made difficult to distribute as a result of their need to be hidden in order for these communities to better-align with explicit hacker rhetoric. I also argue that hackerspaces, as collectives, have certain moral duties that they take on by explicitly espousing their positions as both *best-placed* and *well-placed* to fulfill important interests, and that they are successful in carrying out one set of their moral duties, but fail at another as a result of the tension that exists between this moral duty they have to their communities and the moral duties they have to individuals who exist outside of their communities.

CHAPTER 3: METHODS

I combine several data collection and analysis methods that enable me to develop a deep

understanding of the socio-cultural milieu of a particular hackerspace, Null Alpha, and then situate

that understanding in relation to the broader movement in which that community claims to

participate *from a participant's perspective*. Chapters 4, 5, and 6 present the findings from a

targeted interview study, a broader physical ethnography, and a digital ethnography, respectively.

In Chapter 7 I synthesize my findings to account for both the particularities of developing as a

hacker within a single hackerspace as well as the more generalized experiences of aligning with

hacking as a movement. By contextualizing a deep understanding of one community within the

broader movement with which that community is aligned, I am able to adequately explore the

research questions I outlined in Chapter 1, as well as further understand how the specific

community I studied is representative of all hackerspaces in some ways, and unique in others. The

research I present in this dissertation extends a traditional, single-site ethnography to a study that is

more inclusive of the sociotechnical environments that impact the cultures of these spaces,

including how they are affected by a broader hacker "movement," which often, as I will argue in

Chapters 6 and 7, seeks to control how identities and relationships within these communities can

and should be expressed.

Methodological and Metatheoretical Perspectives

An ethnographic approach is the best methodological fit for developing the understanding I

need to answer my research questions because it relies not on the collection of "what people are

doing, but how they experience what they do" (Dourish, 2014) in a holistic way. Research on

hackerspaces and maker culture more broadly is increasingly more common within HCI and related

disciplines, but much of the recent work in this area has been primarily descriptive, or analytical

only insofar as its framing privileges the research audience; maker culture practices are studied so

that they can be modeled and then imported to other areas of interest, such as K-12 education,

entrepreneurial practices, or research opportunities focused on technological innovation, rather than on the experiences of participating in such communities. Framing ethnography as a way of knowing (Hakken, 1999; 2003) helps me better align the documentation and analysis of cultural practices within an inquiry site—in this case a hackerspace and a listserv—by foregrounding the importance of participants' perspectives and participants' understandings of their practices.

Throughout both my physical and digital ethnographies, I follow a critical qualitative research approach developed by Carspecken (1996) to not only understand what is occurring in these communities, but also: 1) how these communities are sustained over time through member practices; 2) the system structures that enable those practices; and 3) the identities and interpersonal relationships that these system structures and practices either enable or obstruct. Carspecken's approach includes a specialized set of empirically validated tools that enable the researcher to reconstruct qualitative data to explore meaning within illocutionary spaces. This approach has a metatheoretical basis in Habermas' Theory of Communicative Action (TCA; 1984, 1987) and other sources, which situates *mutual understanding* as being obtained through communicative acts, and as possessing linguistic structures. The meanings behind these communicative acts are always intersubjective; that is, they can be thought of as a dialogue between the communicator and an external other, which can range from an actual interlocutor to an imagined potential other. By positioning these meaning making structures as being inherently intersubjective, one can reconstruct the meaning of an action through a pragmatic horizon by exploring the bounded set of potential messages that may have been communicatively transmitted. Reconstructing the meaning of an act requires a deep level of familiarity with the interlocutors in question (built, in my research, through long-term engagement), and is only accessible through a process of position-taking within the context of a social milieu. This process foregrounds an understanding of meaning from the perspective of the participants, which is a vital component to thinking through and analyzing the system structures of hacker culture that enable acts of care.

System structures are one manifestation of the overall system, and are revealed in communicative acts, but do not determine them (Giddens, 1979; Zhang & Carspecken, 2013). The analysis of system structures is made possible by the reconstruction of the communicative acts through which they are implicated.

Dennis (2003) builds on Carspecken's (1996) critical ethnographic approach to account for care ethics as part of the reconstructive analysis process. Dennis' (2003) three-part typology of care characterizes caring acts on two axes; the first refers to the ability of the care-receiver to recognize the act of care in a direct sense (overt or covert), and the second refers to the meaning-imparting strategy of the care-giver (explicit or implicit). This results in three viable types of care: overt-explicit, overt-implicit, and covert-implicit. While it does present an interesting thought experiment, covert-explicit care is not possible, so it is ignored in this typology. Overt-explicit care is recognizable by the participants present for its enactment. The majority of the overt-explicit acts of care Null Alpha involve donating personal resources (e.g., time, money, bodies, and skills), teaching others how to use a specific tool, or attempting to "reward" individuals for doing other kinds of care work. Overt-implicit care-in-action refers to "the caring act that is clear and recognizable among participants, but the mechanism through which the care is enacted is implicit" (Dennis, 2003). In other words, the act is not directly pointed out as care, but others can recognize it as care. This type of care is most evident in how the members welcome visitors to the space, and in the community's organizational structure. With covert-implicit care, caring acts "must hide in the discourse in order to avoid undermining [their] own caring potential. Covert Care-in-Action works off the same pragmatic structures as Overt-Implicit Care-in-Action, but its caring interpretation is masked or left unsaid" (Dennis, 2003). These acts of care are only known to the care-giver, and not by the care-receiver. If the care-receiver were to recognize such an act, it would diminish its effectiveness. In this social group, these forms of care were evident in interpersonal communication among members, and in the physical environment. This typology of care helps uncover the normative

structures at play in the hackerspace as a community by foregrounding the meaning imparting strategies used by participants when engaging in community maintenance practices. For example, I will argue in Chapter 5 that members engage in interpersonal care most often through covert-implicit means. This highlights the tension between the autonomous maker of the espoused maker ethic and the interpersonal maker that an ethic more explicitly grounded in care would foreground.

The combination of Carspecken and Dennis' analytic approaches provides me with the methodological tools to understand system structures and how they are reproduced through specific communicative acts. Built into my methodological approach is an assumption that all communicative acts possess a normative component, and that Dennis' typology of care—developed within this understanding of communicative acts—further enables me to categorize the normative and identity concerns that emerge from reconstructing community maintenance practices through the lens of care.

My focus on identity development and interpersonal relationships is directly influenced by this metatheoretical background, as well as the care ethics perspective I introduced in the previous chapter. I use this care ethics perspective as a lens for framing my analysis, interpretations, and in some cases my data collection strategies, scoping the criticalist perspective I use in approaching this research project. I began incorporating care ethics into my metatheoretical perspective after recognizing the tension that exists between how hackers in Null Alpha initially described their spaces to visitors, and how they actually engaged with each other in the space, which will be further explored in Chapter 4. This care ethics perspective enables me to engage more directly with the vulnerability I observed Null Alpha members exhibiting when performing their hacker identities, and the tacit emotional support and nurturing behaviors other members would engage in to bolster novice hackers' confidence. Care ethics shares the methodological commitment of critical qualitative scholars, facilitating an on-the-ground understanding of participants in their contexts, while shifting the "focus from abstract individuals and their actions to concrete, situated people

with feelings, friends, and dreams—persons who can be cared about" (Hamington, 2010). This combination of qualities within care ethics research—including the commitment to on-the-ground understandings of particular contexts, the ability to foreground nurturing behaviors within interdependent relationships, and the ability to conceptualize moral responsibilities without framing them as universalizing duties or principles—is why I incorporated care ethics, rather than alternative ethical or community-focused frameworks, in my research.

While care ethics can help foreground nurturing behaviors and interdependent relationships, it is unable to evaluate on a larger scale if the particular hacker identity being nurtured or the relationships being developed are appropriate for a specific individual, as the interests of that individual are taken as given in a care ethics interpretation. For example, if a person has an important interest to become a more "independent" person by learning the DIY skills that a hackerspace environment can help them develop, then a care ethics perspective might cast any actions from others that attempt to address that interest by assisting with the development of a hacker identity as acts of care and, therefore, as morally valuable. However, a care ethics perspective would fail, in this instance, to evaluate whether developing such a hacker identity is truly the most economical, ethical, or morally valuable avenue through which that individual could work toward their desire to be independent. Dennis (2013) describes how these "unintended outcomes" through caring actions can begin to be addressed by a deeper analysis of structures, but such an analysis is outside of the scope of this dissertation.

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Research Sites

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Null Alpha – Site of the Ethnography and Interview Study

Null Alpha began in 2010 with a group of friends in a basement working on projects together, sharing their tools and know-how after a robotics club they belonged to disbanded. Floraville, the fictional name for the town in which Null Alpha is located, is a small Midwest US university town of around 80,000 people. As community interest in hacking within Floraville grew,

Null Alpha eventually moved to a shared workspace with another DIY-related group in town, and became the first official hackerspace in the state. By the time I began studying Null Alpha, they had developed a large enough member base to move to a larger, 1,400 square foot location depicted in Figure 1, making room for more members and more machines and tools. During my 19-month ethnography from October 2012 to May 2014, Null Alpha's member population fluctuated between 24 and 31 members, including 3 board members and a handful of regular guests who were not dues-paying members but were still considered part of the community. All of these members have been Caucasian and between 19 and 55 of age, including 2 females, one of whom is a founding member and member of the board. Around 7-9 members used the space regularly to work on projects, with the majority of members only occasionally participating in the space.
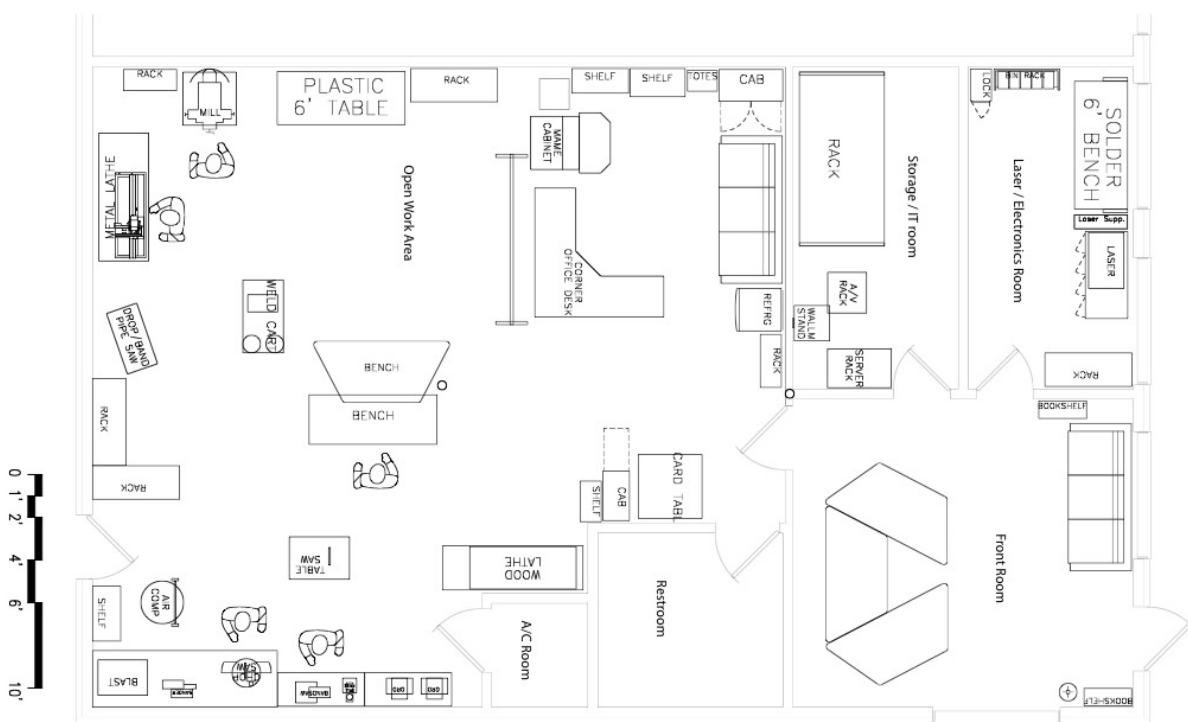
Figure 1. A blueprint of Null Alpha.

Null Alpha consisted of a front entry room used primarily for programming work and member meetings, a small room for the laser cutter and a few select tools, a small room for storage, a restroom, and a much larger machine workshop that housed the majority of the

community's tools and workspaces. The space, the tools, and workspaces were all shared, except for a single locker cabinet that served as private storage space for members who claimed cubbies and (optionally) locked them. Shortly after I left Null Alpha, the community moved to a larger space located closer to the downtown area and the university, with the hope of incentivizing membership growth. I have followed this transition closely by continuing to participate in email discussions with the group and by scheduling regular visits to the space and its members.

Hackerspaces.org "Discuss" Listserv

To complement my physical ethnography of a single hackerspace community, I conducted a subsequent digital ethnography of the listservs hosted by hackerspaces.org, focusing on the "Discuss" listserv. These listservs are publicly accessible mailing lists that were created specifically for discussing hackerspace and hacker related issues. A wide range of hackers participate on this listserv, from hackerspace administrators and members to regular visitors and prospective participants. The discussions themselves take on a wide range of topics from hacker culture debates about what is or is not "hacking" to mundane problems with tracking memberships or hackerspace assets, many of which I will include in Chapter 7. The Discuss listserv is one of the primary avenues through which hackers, on an international level, discuss what it means to be a hacker and manage the community values and identities they share, however loosely.

I subscribed to this listserv while I was a member of Null Alpha, and I read through the majority of the emails as they came in in order to discuss them with Null Alpha's members. It was not until after my ethnography of Null Alpha concluded that I decided to code and analyze the emails, treating the listserv environment itself as its own online community. I characterize this aspect of the study as a digital ethnography even though I did not analyze these conversations in real time because I approached the coding and analysis of the data by first re-reading through the emails as though they were conversations I participated in in real time in order to develop an insider's account of how these conversations could be interpreted by participants. This contrasts

with a more algorithmic analysis of these conversations, which would be able to generate a collection of topics discussed within this listserv, but would not be able to characterize them from the point of view of the participants. I chose to foreground participant experiences of the listserv in this way in order to better complement the physical ethnography I conducted and further develop my understanding of how participants in these communities develop their identities as hackers. This also allowed me to extend the metatheoretical perspectives informing my research to these data by treating them primarily as conversations, rather than as quantified conversational metrics.

Rationale for Site Selections

As a research cite, Null Alpha presented an interesting opportunity to understand how a hackerspace could endeavor to evangelize its position within a town as a place for people to engage with hacker practices. When I began studying Null Alpha, they had just started pushing for a larger membership base, hoping to gain enough members to be able to afford a larger space and more tools. As a result, the way members often presented their space and their community was somewhat at odds with the practices that actually took place and the social atmosphere that actually existed within that space, which provided an interesting opportunity to investigate that tension. Additionally, as the community was relatively young and expanding its member base, I was able to observe how new members learned how to become part of the community.

I do not, and cannot, argue that Null Alpha is particularly representative or particularly unique among hackerspaces, on a general level. No hackerspace is more unique or more representative than any other hackerspace, because each space engages with what it means to be a hackerspace on their own terms and as a result of how their members interpret what it means to hack. Rather than ask whether Null Alpha could serve to represent other hackerspaces, I sought to answer to what extent Null Alpha represented a reasonable interpretation of what a hackerspace could be. To answer this, as well as to help contextualize the hacker identities I encountered in Null Alpha within the broader hacker movement as proposed in my third research question, I analyzed

the Discuss listserv. What I found on the listserv reasonably matched what I had experienced in the physical location, which I will describe in more detail in Chapter 7. I chose the Discuss listserv, specifically, because it is the most participated in email listserv hosted by hackerspaces.org, and is one of the only places for members and administrators of different hackerspaces to talk to each other about the everyday problems they face. This supports the notion that hacker culture is not bound by a geographical field site but instead exists in a multitude of globalized contexts. For pragmatic purposes, I limit the scope of this dissertation to American hacker culture, fully acknowledging that in many ways this is an artificial limitation, as hacker culture is not divided cleanly on national lines.

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Data Collection Procedures

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Data for the ethnography were collected primarily through participant observations and interviews, and data for the listserv analysis were collected by scraping the publicly available listserv email database for archived emails threads.

Participant Observations

My participant observations in Null Alpha took place over a period of 19 months (10/2012-05/2014), and included approximately 250 total hours of direct contact with participants. The data generated were in the form of jottings, field notes, photos, and recordings of notable events. During these participant observations, I took on a range of observer roles from fly-on-the-wall observations to full participation and engagement with members. In all of these roles I was always considered a full member of the hackerspace and given the same level of access that other members enjoyed. I paid the same monthly dues that other members paid, I made use of the space on days that were not open to the public, I took out the trash, I helped organize events that took place within the space and outside of the space, I fixed visitors' broken projects when they came in for help, I tinkered and hacked alongside other members, and I volunteered to run the soap making processes with the vacuum former booth during two of the annual maker conferences Null Alpha

hosted at the local convention center (while wearing my "Null Alpha" t-shirt. In short, I acted as a member and the other members considered me to be a member, I just also happened to be studying the space. All members of Null Alpha knew that I was studying how they interacted within the space and with each other, and I constantly endeavored to make my role within the space clear, especially as new members joined after I began studying it. Perhaps because this community was already fairly scientifically-oriented, my process of becoming an "insider" was fairly quick and uneventful, and I was quickly asked to help take notes during rare member meetings, and to help greet visitors if I recognized that someone new needed a tour.

Interviews

This dissertation includes two sets of interviews, and both are part of the larger ethnography, informed by what I saw taking place in the hackerspaces and what I wanted to learn more about. The first is a series of expert interviews I conducted during the first half of the ethnography specifically to investigate the self-made tools I found in Null Alpha, and the members who made them. These interviews are included in the analysis in Chapter 4. The interviewees (all white male, between 19-40 of age) were recruited based on their participation in the space and the role their tools played. The toolmakers had various careers as programmers, web and application developers, and even one cyclotron operator. Whenever possible, interviews were conducted in the hackerspace where the tool making took place, but some interviews took place at local coffee shops or the homes of the interviewees, based on their preferences. The interviews were minimally structured, intending to draw out conversation as informally as possible. As broad conversation guides, I asked my interviewees to tell me about their backgrounds and experiences with making; specifically, questions centered on (1) how, why, or when they made their tools, (2) material engagements, strategies, and their ideation and construction processes, (3) the roles these self-made tools played in specific projects in particular and within the hackerspace in general, and (4) the perceived value and meanings of these self-made tools to the makers (see Appendix A for the

protocol). The expert interviews produced 12 hours of recordings, notes, and photos of the tool-making processes and the actual tools, which were transcribed for analysis.

The second set of interviews, which comprise part of the ethnographic data presented in Chapter 5, focused on the role that Null Alpha played in members' lives and how they think about what it means to be a hacker. These interviews followed a critical interview protocol (Carspecken, 1996) that allowed the interviews to proceed as emergent conversations that focused on discussing with participants their justifications for claims to knowledge and opinions, rather than simply asking participants for factual accounts of events (see Appendix A for the protocol). This critical interview protocol was intentionally chosen to align with the dialogic nature of identity and intersubjectivity that the critical qualitative approach I employ relies upon, building on the participants' expertise, and tapping into their tacit knowledge. In this technique, lead off questions within a topic domain are paired with covert categories of interest and potential follow-up questions. Covert categories of interest help the interview flow more organically while helping the interviewer keep follow-up questions aligned with questions that cannot be asked directly without biasing participant answers. For example, rather than ask participants how important the hackerspace is for them, I would ask them to tell me their favorite stories about Null Alpha, and follow up with questions, based on their answers, that could help me understand how important the space is for them without asking that question directly.

Listserv data collection

I developed my own web scraping script to download the message body, subject, date, and author of every email sent through the largest listservs hosted by hackerspaces.org—including not only the "Discuss" list, but also the "Equality," "Theory," and "Event Theory" lists—between the conception of the first listserv on this site in July 2008 through to the end of June 2015. In this dissertation I focus on the Discuss list, which has a much larger participating audience and an even wider reach. The Discuss list data set includes 885 distinct author names, 10,606 total messages,

separated into 1,896 individual message threads with an average of 5.59 messages per thread (SD=8.62). In calculating the total number of threads, I applied significant effort to finding and rejoining threads whose subjects had been somewhat altered by human error, relying partially on algorithms created for that task, and partially on personally cleaning the data by hand. I also worked to clean the author names that were similar but had changed over time as the participant switched primary email clients, or left and rejoined the list at a later date.

The analysis I present in Chapter 7 is based on a subset of thirteen of the threads, which I determined by combining the ten threads with the highest number of individual emails in them with the ten threads participated in by the highest number of distinct authors. These two top-ten lists overlapped significantly, resulting in thirteen distinct threads. These thirteen threads include 199 distinct authors, and 851 total emails with an average of 26.92 authors per thread (SD=5.24), and an average 65.46 messages per thread (SD=15.79). Being generous with my associations between gender and author names, only 6% of the emails in these top thirteen threads were from women.

Data Analysis

Each chapter of this dissertation is based on an independent analysis of a slice of the data presented above. The interview data included in Chapter 4 comes from the first of the interview studies I described, and was analyzed by my collaborators and I through a procedure known as *explication de texte*, or close reading. This analytical method originates in the humanities (Ogden & Richards, 1923) and involves the careful examination of diction, rhetorical devices, style, and other formal and thematic elements in a text. My collaborators and I conducted our close readings independently to identify an individual set of themes. Subsequently, the entire research team collaborated to combine, refine, and distinguish among themes before arriving at the critical synthesis of quality, described in Chapter 4.

The analysis of my ethnography presented in Chapter 5 was conducted in two stages. In the first stage, I created thick records of my data, which consisted of ethnographic data and quotes from the second series of interviews I described above. Critical incidents within this data were identified and analyzed through reconstructive techniques, including meaning fields, validity horizons, sequence analysis, and role analysis. In the second stage, my collaborators and I categorized instances and events from these thick records using Dennis' three-part typology of care (2003). Dennis' typology of care aligns specifically with the metatheoretical framework employed in Carspecken's critical qualitative research approach (1996), and represents one of the only operationalized frameworks available for an empirical study of care-in-action. After first enumerating the possible meanings behind intersubjective acts using various reconstructive techniques in Carspecken's approach, one can then analyze those intersubjective acts through Dennis' typology to find patterns in the reconstructed acts of care, further elaborating on the normative system structures in place that make some acts of care possible while preventing or obstructing others.

Analysis of the thirteen email threads from the listserv data was conducting using the constant comparative method (Glaser & Strauss, 1967) to highlight themes of importance to the global hackerspace community, as well as how they discuss the kinds of interpersonal relationships they believe should or should not take place. I coded the 851 messages from these thirteen threads through two rounds of coding, using a custom-built coding tool that allowed me to read through each email in the order it was sent, even across threads. This helped me pick up on references made within one thread to another thread, which would have been difficult to pick up on if I had read each thread independently, as several of the threads overlapped. In the first round of coding I open-coded the messages to generate a list of discussion topics and themes, as well as characterizations of how participants on the listserv interacted with each other and how they described their interpersonal interactions in their individual hackerspaces. I then reorganized the

resulting codes and grouped them into larger themes that were more directly relevant to the community maintenance practices, values, norms, ideologies, social policies, and interdependent relationships hackers discussed, as well as the impact those themes had on hackers' practices, participation, and identity adoption. I used this axial coding to inform the second round of selective coding, which categorized each of the 851 messages in a more structured way. After coding the second round, I visualized the codes in Tableau to get a sense for what the predominant attitudes were throughout each thread. These codes were used to help characterize the threads and trace the topics commonly brought up within them, as well as to help characterize the kinds of relationships that were sanctioned (and which were not) through these discussions.

I synthesize the findings of these analyses in Chapter 7, using Stephanie Collins' dependency principle as a care ethical lens to explicate the moral and ethical duties hackers and hackerspaces take on by describing their communities as they do, and then to evaluate how well these duties are carried out. I use Collins' principle as a way to focus on the intersection of what I am able to describe through my physical ethnography and interviews I conducted in Null Alpha and what I am able to describe through my digital ethnography of the Discuss listserv. The analyses of both of those contexts can speak to the vulnerability and interdependence hackers exhibit in the process of developing hacker identities, and how the (non-)adoption of social policies and reinforcement of behavioral mantras enable the fulfillment of one set of ethical duties, while limiting the ability of hackers to fulfill others.

Methodological Concerns

I employed several measures to protect, as much as is possible and reasonable, the validity of the findings I present. In both the physical and digital ethnographies, the following two questions can help frame these measures: 1) "How can I guarantee that what I say happens in these communities actually happens?" and 2) "How can I guarantee that I know whether these events are typical or atypical?" For the Null Alpha ethnography, the first question can be answered

with support of the field notes, photographs, and video and audio recordings I have collected, as well as with corroborating accounts—through member checking or other techniques—from other members of Null Alpha. Since the listserv is based on a collection of emails that serve, for the most part, as concrete evidence, answering the first question relies on validating or justifying that my interpretations of those emails are accurate. To ensure I was not misrepresenting these conversations, I asked peers to read samples of these emails and discuss their interpretations in a process of peer debriefing. I occasionally asked members of Null Alpha, specifically board members who I knew actively participated on the listserv, what their interpretations of these emails were as well.

The answer to the second question relies on my long-term engagement with these communities and participants, and the resulting experience I have gained to qualify me as an expert of this particular context. This prolonged engagement similarly mitigates concerns of potential Hawthorne effects, in which research participants alter behavior as a direct result of being aware of being observed. By engaging long term with these communities I became a stable fixture such that interactions hackers had around me became, by definition, "normal" even if they might have become slightly different from before I started observing them. I engaged with more extensive validation beyond member checking with key informants and peer debriefing through strip analysis, in which "strips" of primary data are checked to see if they match commonly occurring cultural norms of that community, and negative case analysis, in which cases that do not appear to "fit" the cultural milieu are analyzed closely and used either to demonstrate that the commonly found cultural themes are lacking to the point that they cannot explain this negative case, or that this is simply a case in which participants have drawn from an alternative set of cultural norms that lay outside of this context (Carspecken, 1996).

The final methodological concern is about anonymization of data. All participants' names have been changed throughout this document. However, it is still possible for participants of Null

Alpha to be connected to data in this dissertation through the use of publicly available information they post online about their projects. This anonymization weakness was explicitly discussed with all participants, and included on both the study information sheets and informed consent forms they received upon agreeing to be included in my studies. The anonymization of data I collected from the listservs is more difficult. While the data I collected in my listserv study are publicly available data and, therefore, fall outside of the realm of IRB approval, I do not believe that my ethical commitment to these participants ends with the understanding that their emails are technically available to anyone with access to the internet. As Vitak, Shilton, and Ashktorab point out in their analysis of similar large-scale data resources (2016), the ethical considerations are much deeper, and should be engaged on a case-by-case basis. While I do not believe it would be reasonable for me to obtain informed consent from all participants on this listserv, I do believe that I must, to the best of my abilities, consider how they might react to my use of their quotes, regardless of the legality of the study as described by the IRB. In this particular case, I made the judgment that many of the conversations on this particular listserv are ethical to include in such a study because: 1) this list is specifically described as a public forum for discussion about hackerspaces and the hackerspace movement, so members who participate have no reasonable expectation of privacy since their emails are not only publicly available in the hackerspaces.org archive, but are also displayed in multiple other contexts and in a variety of formats; 2) these participants, by nature of their participation in these threads, are more likely to be technologically literate enough to understand how their data could be used in this type of secondary capacity; 3) the use of their publicly available data in this way is specifically in line with the open data ethos that pervades hackerspace culture; and 4) the names they associate with their emails on this listserv are typically hacker handles or nicknames, and usually not their real, legal names, adding an extra layer to the anonymization I have employed by referring primarily to the automatically created post or author IDs generated during analysis. The combination of these considerations presents an ethical case for

including quotes from this listserv, despite the fact that the anonymization practices I have been

able to implement are not sufficient to truly protect these participants' identities.

CHAPTER 4: DEVELOPING HACKER IDENTITIES

Shortly after beginning the ethnography of Floraville, it became clear to me that an individual's ability to identify as a hacker was mediated by the connection they would develop with the tools, projects, skills, and processes they frequently employed within the space. In other words, individuals relied on their expertise with particular tools or practices as a way to signal to others that they truly deserved to be called a "hacker" or "maker." This mediation of their identities as hackers appeared to be particularly strong when the tools they described were *ad hoc* tools they had created on their own and for a particular purpose. To further explore this connection between their ability to identify as a hacker and the tools they created or gained expertise in, I led a series of interviews with a focus on self-made tools. This chapter is based on the findings of that study[5].

In this chapter, I will discuss these factors that supported the adoption of a hacker identity, and I will explore how this identity-adoption process seems to be tied heavily to the tools, projects, and skills they develop within the space. In the first section, I define what I mean by the development of a hacker identity, how there are different degrees to this identity, what I mean by self-made tools, and how I characterize the adhocist attitude toward making I saw in this space. I then introduce the tools and projects I studied, both in this interview series as well as in the broader ethnography, and I discuss what these tools reveal about developing a hacker identity within this particular hackerspace community. In the final section, I synthesize these findings, indicating that the formation of a hacker identity is shaped heavily by an individual's ability to: 1) use and extend their tools and materials; 2) adopt an adhocist attitude toward the making or hacking process; and 3) engage with the community of hackers in which they are embedded.

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[5] Portions of this chapter draw on my first-authored paper published in the Journal of Peer Production: Austin Toombs, Shaowen Bardzell, and Jeffrey Bardzell. "Becoming Makers: Hackerspace Member Habits, Values, and Identities." *Journal of Peer Production* (2014).

Key Phrases

Hacker Identities

Throughout this dissertation I discuss the process of adopting a "hacker identity." I use this phrase to include a plurality of identifications with the modern hacker, maker, and DIY movements, from people who undertake significant DIY home repair and craft activities, to people who subscribe to *Make* magazine or regularly peruse Instructables.com and simply *imagine* themselves building projects, even if they never do. My conceptualization of the hacker identity is influenced by related characterizations of creative individuals, such as Kuznetsov & Paulos' "expert amateurs" (2010), Wakkary & Tanenbaum's "everyday designers" (2009), Anderson's "makers" (2012), and Levy's "hackers" (2010)—which today some would call "crackers." Each of these terms can describe someone who builds or does things for her self—sometimes as part of an anti-consumerism statement, but often because it is practical to do so—and who incorporates the set of attitudes, skills, behaviors, or expressions associated with those practices. I use "hacker identity" throughout this dissertation to refer to any variation or combination of these identities.

While I intentionally use this term loosely, I do, however, distinguish between different degrees of hackers or makers, drawing on how I have seen participants in this culture distinguish between someone who has just recently started trying out this identity, versus someone who could be seen as a more *established* hacker. On one side, we can find someone who occasionally participates in DIY activities and considers herself a hacker because of those occasional practices. On the opposite end, we can find someone who regularly and actively seeks out or creates her own situations for do-it-herself activities. Every individual who regularly participated at Null Alpha would fall somewhere on this continuum, with almost all of them seeking to become a more established hacker. But how exactly does one become an established hacker? What sets this identification apart from those who are happy to simply follow the instructions of an O'Reilly learn-to-solder kit without creating their own? How does the tenuous or intangible nature of the distinction between

one degree of hacker and the next impact an individual's ability to connect to the identity? How are these identities validated by others within the community? Throughout this chapter I begin to answer those questions through an analysis of the tools members connected with, the tools they would make for themselves, and the skills required for both, which appeared to serve a grounding function for those attempting to prove their hacker-ness.

Tools and Self-Made Tools

Many studies on hackerspaces, makers, and the DIY movement focus on how individuals utilize already-existing infrastructures—primarily individual tools they use but also occasionally the systems of tools they now have access to—to act out their roles as hackers, makers, crafters, tinkerers, etc. When focusing on self-made tools, this focus from how hackers are empowered through available technology and infrastructures is shifted to a focus on how they often create their own conditions of empowerment. In this chapter I rely on three separate formulations of "tool": a common-sense or everyday understanding of tool, an emic account of tool found in the hackerspace, and a definition that draws on various research on tools.

The first is an everyday understanding of "tool," which I used early on to recognize the importance of the roles tools, specifically self-made tools, played in the space. The key distinction between a tool and non-tool artifact is the focus on the artifact's role in the creation process; a non-tool artifact is an end result of a process, but a tool represents a means *toward* an end. I saw the use of homemade tools as one that separated the kinds of making found in the hackerspace from forms that can exist easily outside of the space and, therefore, as a way in to investigating the process of becoming an established hacker in this context. In this operational definition, an artifact is a tool if it is used in a process of creation separate from its own creation, or in other words, if it is used by the hacker to create other artifacts, and self-made tools represent a process by which these hackers create *means*, rather than *ends*.

The second formulation of "tool" is based on an emic account of the concept from the hackers themselves. When I began interviewing the members about the tools they have created in the space, I was careful not to impose my interpretations of what constitutes a tool, instead allowing them to interpret what "tool" meant for them and judge which of their projects would count. This allowed me to expand on my own notion of "tool" while staying true to an insider's perspective of the concept. The emic account of "tool" surprised me, because it seemed much more inclusive than I had anticipated, including not only objects that are manipulated by hand to fulfill a particular purpose, but also any object that could loosely be characterized as fulfilling some need, such as storage boxes and reference materials.

This surprise prompted my colleagues and I to consider formulations of "tool" available in the research literature, which constitutes the third formulation. This literature includes works about tools from sociology, education, architecture, art, critical theory, and information design. Tools are instruments we encounter and use to accomplish tasks. Art historian Howard Risatti (2007) defines tools as "something used directly by the hand with an intention to make some*thing* by doing something to material" (pp 49-50, emphasis in original). They are instrumental and have a pragmatic function, since they are used to make other things. A tool to McCullough (1996) is "a moving entity whose use is initiated and actively guided by a human being, for whom it acts as an extension, toward a specific purpose" (p 68). Tools are manually operated and are, in Risatti's words, "kinetically dependent" in that they require us or something else to activate their function (2007, p 51). When such an operation stops, tools cease to work; accordingly, a tool is "some*thing* with a 'tooling' potential and that a thing becomes a tool in the process of being put into action, of being put to 'work'" (Risatti 2007, p 43, emphasis in original). Synthesizing, these formulations suggest that tools are material objects that are put to work through intentional human action, and that their potential is latent except when they are used.

Such a description of tools reveals three additional characteristics about the relationship between tools and tool users: that tools direct our sensual engagement, that they require practice for mastery, and that identifying the right tools for the tasks at hand demands reasoned judgment. These activities are necessarily context and medium-dependent. As an example, consider a well equipped shed and in exactly what ways it is conducive to gardening. Through practice, a gardener knows how to operate a single tool for a particular medium, and when necessary, can select appropriately a combination of different instruments (e.g., lopping shears, pole pruners, hedge shears, and pruning saws, etc.) to trim overgrown branches. For McCullough (1996), tools "come to stand for the processes. This symbolic aspect of tools may help you clarify your work…Holding a tool helps you inhabit a task" (p 61). Gelber similarly claims there is a reciprocal relationship between work and the tools that are used to make it (1997).

Tools are also described as prosthetic, because they extend and enhance human capabilities. Sennett (2008) makes a distinction between *replicant* and *robot* tools. Replicant tools mimic human abilities while supplementing and amplifying them in specific ways. A spatula is a replicant tool because it expands our capacity for heat tolerance, allowing us to handle food beyond the body's natural ability, while nonetheless mimicking the manual behavior of flipping and arranging objects on a surface. A robot tool is "ourselves enlarged: It is stronger, works faster, and never tires" (Sennett 2008, pp 84-85). A car can be seen as a robot tool because its power moves us quickly, and we tire of riding in it far sooner than it tires of transporting us.

In addition to extending our physical capabilities, tools also position us in the social world. As Illich (1980) writes, "An individual relates himself in action to his society through the use of tools that he actively masters…To the degree that he masters his tools, he can invest the world with his meaning" (p 22). Tools are thus future orienting, providing mechanisms for users to envision and then to bring about future worlds.

Summarizing this research, tools connect human understanding to the material world through the possibility of change; they extend or augment, sometimes radically, human capabilities; they require us to change our physical behaviors, skills of imagination, and judgment to learn how to use them well; and, if all of this happens, they empower us to envision and pursue new futures. The development of this kind of tool sensibility is an integral part of becoming a maker, as it has a profound impact on an individual's perception of their abilities. Self-made tools take this even further, demonstrating not just a sense of judgment for when to use particular tools, but also for recognizing when an existing collection of tools is lacking and needs to be augmented. When hackers create their own tools, they self-empower, breaking through the limits on their potential dictated by their current access to tools. These self-made tools can enable new techniques and abilities, or, more commonly, tweak or specify old ones. Both instances offer rich, unique accounts of how individuals interact with and relate to technology. Research on hacker's and maker's tool use and self-made tool construction can reveal much about how an individual develops such an identity. One of the first steps in being able to create such tools in these spaces, however, relies less on the abilities they have upon entering the space, and more on their attitudes about the creative process.

Adhocism

My interest in the concept of adhocism began as the result of my observations in the hackerspace, where maker activities could be characterized as informal, impromptu, and provisional. Rather than plan an entire project, they often relied on an assumption that they would be able to solve problems as they arose, and worked with more generalized guidelines informed by their experiences in the space. After first developing an emic understanding of how projects progressed in the space and noticing this quality of the attitudes toward project work, I began seeking out literature on similar creative processes at the urging of my collaborators, eventually

leading to the concept of adhocism, which I was then able to use as a lens for studying the tool making activities and behaviors of the makers.

Architectural theorist Charles Jencks and architect Nathan Silver (2013) define *adhocism* as "a principle of action having speed or economy and purpose or utility, and it prospers like most hybrids on the edge of respectability" (p vii). Throughout their book, adhocism is presented simultaneously as a legitimate *production strategy* and as its own *product style* for finished products, be they architectural designs or NASA's space equipment. As a production strategy, adhocism focuses on efficiency, economy, approximation, adaptability, and pragmatism, often drawing on "an available system in a new way to solve a problem quickly and efficiently" (Jencks & Silver 2013, p vii). As a product style, adhocism visually foregrounds the juxtaposition of these available systems, making explicit their connections and differences while showcasing their hybridity. My conception of adhocism is focused primarily on the former characterization, though the aesthetic qualities of *adhocism* are also apparent throughout the space. I also incorporate here the work of Lucy Suchman (1987), enabling a consideration of the situatedness of the maker's actions without necessarily labeling the adhocism observed in those actions as intentional.

The notion of adhocism as revealed in this hackerspace is closely associated with the maker's judgment throughout the making process—the judgment required to choose appropriate tools or methods to complete the project, the judgment used to decide whether to purchase or make a required piece of the project, and the judgment used to determine if the maker has the required competencies to complete the project. An adhocist project is not planned out ahead of time, but carries the assumption that each piece of the problem will be figured out as it becomes important. There is an overall sense of the big picture of the project, but it is seldom expressed as more than just a sense. A member of this space attempting to plan every detail of a project would often be gently teased for over-planning, and not jumping right into the hands on portion of the

project. The adhocist attitude common to many of the projects I investigated is more than simply an approach but is also an identity expression: "we work in this way because we can."

The Hackers and Their Projects and Tools

In the following sections, I will introduce several of the key players I encountered during my ethnographic observations and interviews by explaining their primary projects through which they were commonly referred within the hackerspace. I will discuss how their projects and tools served to contextualize them within the hackerspace community at large, demonstrating their developing adhocist attitudes and tool and material sensibilities. These tools were often lightweight, offbeat, inexpensive, unpolished, and pragmatic. They showcased hackers' spontaneity, intuition, style, and their familiarity with the hackerspace and the materials, tools, and other resources it had to offer. Often they highlighted their creators' frustration with the limits of available or existing tools, and therefore they reflected not only purposefulness but also an expression of the hacker in those moments.

Mike's Lock Picking Tools

Mike, an undergraduate student at the local university studying computer science, developed an interest in lock picking shortly after joining Null Alpha. Lock picking is seen like a sport to those in the security and hackerspace communities, and at many hacker and security conventions (e.g., Maker Faire, Defcon, etc.) it is common to find lock picking tutorials, challenges, and games. After being introduced to lock picking through his interactions in hackerspaces and security conventions, Mike explored making his own lock picking tools.

Figure 2. Mike's lockpicking tools: tension wrench (left) and lock picks (right).

One such tool is a tension wrench (seen in use in Fig. 2), which is a small piece of metal used to apply tension to a lock while it is being opened by a pick. Mike made this particular tension wrench by hammering a piece of metal he found on the floor of the hackerspace into a shape that complemented the other tension wrenches he owned, which could not be used counter-clockwise on locks positioned on the right-hand side of a door. When asked about why and how he made this tool, Mike said:

> *I had the steel around. Wanted a tension wrench now. Didn't want to wait for one in the mail. So I just made it. [...] There's probably not a real good excuse for me to make that tension wrench, other than because it was fun. If I had to buy the metal it wouldn't have been cheaper. If I actually had to get the material it wouldn't be cheaper. [...] I made this tension wrench because the one I had is angled to be used like this [horizontally], but the issues is, if I need to turn a lock clockwise for example, and it's on the right side of the door, then this tension wrench would get in my way. The other way...it actually gets in the way of my picks. So I needed a tension wrench that's vertical instead so I could get into the lock.*

In this case, the motivation for creating the tool was more about being able to test out his ability to do so, and less about an actual need he knew he had before finding the extra material on the floor. The additional functionality was seen as a side-benefit.

Mike also made several bump keys, which are key blanks that are filed down to an estimated average of where the pins in a typical lock need to be set for it to open. Bump keys work by being "bumped" while placed in a lock in order to set the pins of the lock in the right place, thereby opening the lock. Bump keys can work very quickly for certain situations, but are more of a novelty tool than a practical one because there is a high risk of permanent damage to the lock. Mike owns several bump keys that he has made, one that he made out of an old key he no longer needed, and another that he made out of a scrap key he found in a bin next to a key cutting station in a Wal-Mart. These bump keys, much like the tension wrench, were made more as a result of Mike's access to extra materials and his general interest in lock picking, rather than because he had a direct need for the tools. In fact, Mike said he never planned on using the bump key, he just made it because he could. When asked why he would make these tools if he did not really need them, Mike said:

> My biggest incentive to make things is that I'm cheap. It's not that I need to be, but I enjoy it. It's really fun to achieve whatever task I'm trying for in the least expensive way. […] The thing I have the most of is time, not money.

His desire to see what he can get away with without spending any of his own money, just his time, is one of the defining aspects of his identification with hacking. As a result of this desire to create tools for cheap, Mike has developed a significant understanding of the material qualities of what makes good lock picking tools. As we can see in the following quote, materials for the actual picks must fulfill a range of material characteristics:

> I haven't actually made many picks, or I don't use many that I've made because picks that aren't properly hardened can be a real pain to use. So what Nolan has told me is about the best thing he's found—that the best and easiest way to make your own picks is to use hack saw blades. I've not had my hands on any hack saw blades, the only picks I've made—I have a couple I've repurposed out of dental tools, and I've made a couple of others out of tweezers. And they worked but they're definitely not as good as these [purchased] ones are, because they don't bend…I need them to be stiff."

And when discussing a vibrating pick he tried to make based on a YouTube video:

> The vibration removes all tactile feedback from the tool, because the only thing I can feel in my hand is a pager motor going 'whiiirr,' and it doesn't really matter what happens on the

other end. So if you ask me, rubbish. I would advise you don't do that. … That's another thing I don't like about thick foam covers [as handles on the lock picks]."

In trying to create his own lock picking tools out of a desire to be pragmatic or thrifty, Mike has developed a sophisticated understanding of not just the tools and how they are used, but of the materials that comprise those tools as well.

Nolan's RS232 Cable Hack, Bubble Etcher Tool, and Rumble Challenge

Nolan is a server administrator in Floraville and is one of the board members of the hackerspace, as well as one of its founders. As one of the prominent members of the space, his projects tend to attract more attention than others', especially because much of the time he spends at Null Alpha is dedicated to helping others with their projects, rather than spending time on his own. One of his projects that was particularly popular during the time when I was first visiting Null Alpha was a hack he had created in order to connect an LED marquee to his computer to control the messages it displayed. To do this, he modified some straight-through cable he had around the space so that it would mimic the RS-232 communication protocol required by the marquee. The marquee came from a yard sale and did not have the proper cables for programming it; Nolan's self-made tool fixed the problem and eliminated the need to search for a replacement part, which would have been difficult to locate. A reflection I wrote based on the entry from my field notes for the day when I first saw this project reads:

> *When we all came in to the space for that night's public meeting, the LED marquee was on the table in various pieces while it was still being put together. Coming out of one end of it was the straight through cable [Nolan] had been pulling apart and soldering back together to get the marquee to communicate with his computer through the scripts [Charles] found from another hackerspace. The end of the straight through cable attached to the marquee had been split open to reveal the wires inside. Some of these wires were taped in place inside the head of a telephone jack that was plugged in to a port on the marquee. The other wires were either taped together to simulate a 5v signal to itself, or were soldered directly onto the logic board of the marquee. On the other end of the straight through wire—the end that attaches to the computer—was a series of converters: the wire was directly attached to a DB9 shell, which was plugged in to a serial to USB adapter, which was then plugged into the laptop. [Mike] pointed at this while explaining it all to me and said, "Now **that's** definitely a proper hack."*

Figure 3. RS232 LED marquee hack.

Described as "a proper hack," Nolan's RS232 cable was created by splicing open an extra straight-through cable, soldering it to the inside of a connection jack, and soldering parts of it to itself to mimic the 5-volt connection signal the proper cable would have communicated. When asked about the materials included in this project, and how he knew he could combine them in this specific way, Nolan said:

> *It's just straight through cable for wiring that I just happened to have on hand. I use a lot of Ethernet for things but that I just happened to have around. And [the marquee] says on there it uses RS232, so there's a serial connection so I could probably get away with straight cable. … so I made a crimp connection with a telephone connector. […] If it says 'RS232' I mean you can pretty much—As long as you know what connectors it's using, it can—that's like the hardware protocol, and how the software talks over it can use the connections in different ways. There's like handshaking pins that you don't usually have to use. I didn't even care what speed it was if we couldn't figure that out we could just set our baud rate and our bit rate and just try things until you get something to communicate, as long as you know the protocol or have something that can talk with the right protocol.*

For a time, this project was shown to many visitors of the space as an example of the kind of projects that can take place here. It exemplifies a rich combination of values commonly found in these spaces, including: the desire to salvage equipment that otherwise seems broken beyond possible use; the desire to be able to understand the materials so deeply that one can dive right into modifying them and using what is at hand, rather than seeking out specialty equipment; and the desire to appear as if one is breaking expectations or rules of some kind, combining technologies and skills in unexpected ways.

A different set of hackerspace values are exemplified in the bubble etcher, one of Nolan's other tools. This bubble etcher shortens the process of etching PCBs while also requiring less etchant solution (in this case, hydrochloric acid), resulting in an overall more sustainable, more time-efficient, and safer solution than traditional etching methods. This self-made bubble etcher is made from two pieces of plexiglass, an aquarium bubbler, plastic tubing, and silicone caulking, and is based on several designs Nolan found online.

Figure 4. Bubble etcher.

When asked what his process was for creating this, Nolan said, "People have been building these, and I just basically eyeballed what they had and then just built one by eyeballing it. … YouTube videos, I didn't even look at real plans." He built the bubble etcher specifically to help out with a workshop Null Alpha was organizing to teach others how to create their own PCBs, but that workshop eventually fell through and Nolan assumed that the tool had sat unused in the space since then. He and I found out later that Jennifer had used it several times, which surprised Nolan

because he also had not been sure if it would work or not. Nolan reflected on this when I asked

him about the large volume of projects he seemed to have at the space, saying:

> *When you see people who put out lots of successful projects, what you don't see are all of the failed projects. For every one that's successful, there's at least a dozen that are not, for various reasons. Either didn't work out and went to the scrap bin, or got halfway done and the project team ended, or got bored, something else new and shiny showed up, or some things like this where you build something and now I don't have to work at that until I need to etch a circuit board. The next time I really need to etch a circuit board, this will get finished and I'll use it. But I don't do that but once in a blue moon.*

Perhaps as a result of these experiences, Nolan is a very patient mentor within Null Alpha, often

relying on whatever tactics he can to help people help themselves. When asked why he spends so

much of his time teaching people the skills they need to work on their own projects, rather than

doing the work for them, he says:

> *I've had enough projects be successful that I have confidence in what I can and what I can't get done, and it's really something for other people, like if I'm talking to people about a project or something and someone's like, 'Oh, you know, I- I never in a million years coulda built something like that," and I was like, "Well, you know, I mean, it took me a long time <laughs> to get here, you know. Don't feel bad. Don't rule it out.' Because for every one project I've got at least a dozen others sitting unfinished in a back room. […] I guess at a low level something I didn't realize that other people don't have such a good ability with is just sometimes just working with hardware, like say you need to make a case for something, a project or something, and I mean, taking some metal and just banging on it until it bends to your will or something and then forms around what you're doing. Again, I grew up with my dad's family doing this stuff all the time, but learning how to, I don't know, get physical objects to respond the way that I want <laughs> and that's kind of like a low-level thing.*

This familiarity with materials and tools is one that Nolan recognizes can only come with practice,

so when someone comes to him with a problem they have for their project, his first response is to

get them started using whatever tool he would use to solve the issue.

For Nolan, this desire to help others grow these hacker skills extends to creating what could

be considered educational or practice tools. One of the more successful projects Nolan likes to

show visitors is a lock picking game he built to bring to security and maker. This particular game,

called the Rumble Challenge, has several participants attempt to unlock their lock within a time

limit, but once that time limit is up the device rumbles with a powerful motor.
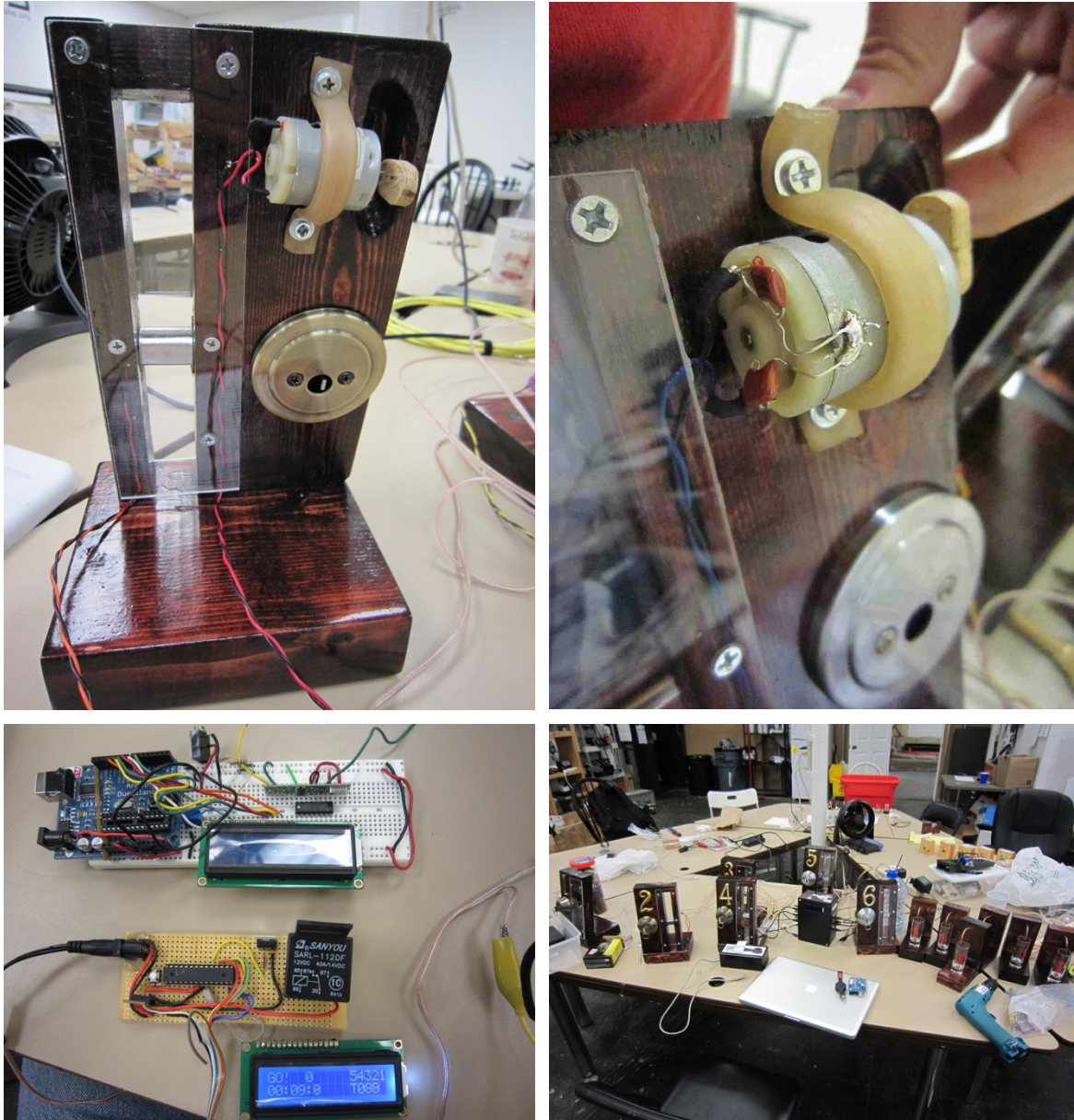
Figure 5. Rumble hack lockpicking game.

Outside of Null Alpha, Nolan was well-known among security conference participants through a podcast and YouTube series he ran that explored security issues primarily with computers and technology. When creating this game, Nolan was intentionally playing into his reputation in this field to help further boost an interest in lock picking, which—aside from benefiting from the sale of lock picks at his booth at these conferences—he saw as a way to help people become more aware of their own personal security at home: if you could pick through this lock in less than a

minute, how easily could a trained lock-picker break into your home? Thus, this game served two primary purposes: 1) it was fun and Nolan enjoyed building it and enjoys sharing it with others so that they can have a chance to practice a skill; and 2) it forces individuals interacting with it to confront their assumptions about their personal safety at home, and (hopefully) inspires them to educate themselves more fully on issues of security.

Jennifer's Bug Bots Workshops

Jennifer, a system administrator in Floraville, is one of the founding members of Null Alpha and has been on the board since it started. At one point in time, Null Alpha's only physical meeting space took place in her basement. Many of her projects within the space focused on outreach activities: ways to increase Null Alpha's visibility within Floraville, ways to incorporate maker educational activities in children's workshops, and ways to invite other similar groups in town to join Null Alpha's efforts. One of the workshops that Jennifer regularly organized involved teaching children to solder by helping them build simple robots called Bug Bots. These and similar events took place most often at summer school programs, at the local children's museum, and in library workshops.
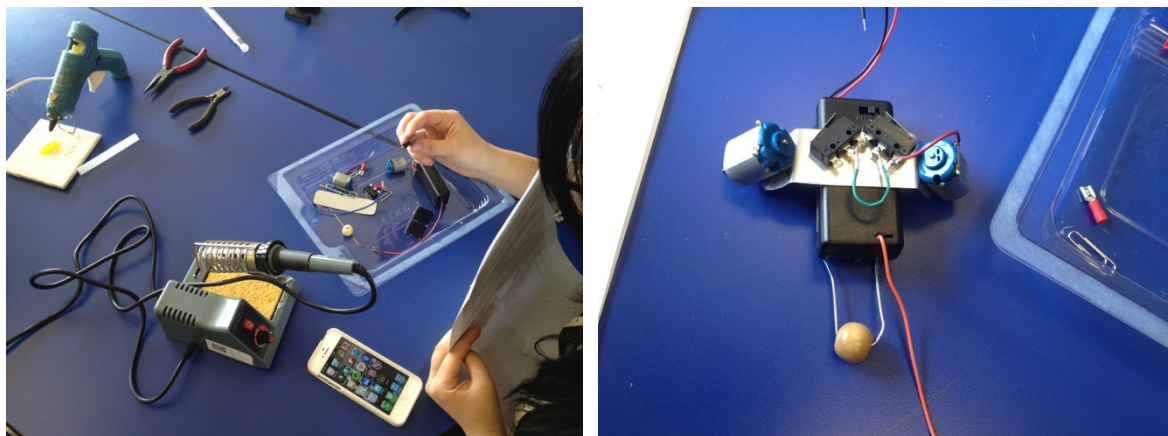
Figure 6. Bug Bots soldering workshop.

As with Nolan's Rumble Challenge, Jennifer's Bug Bots workshop is designed specifically to make the barrier to understanding how to solder feel lower: they present soldering not just a

challenge appropriate for children to take on, but also one that is easily forgiving of mistakes. The field notes I took on a day when Jennifer was preparing me to assist her with one of these workshops read:

> *[Jennifer] gave me the bug bot walkthrough again, because I planned on attending the bug bot workshop on Saturday and needed to know how to help the kids put them together. You can definitely tell that she has showed these off to a lot of people, because the speech she gave me this second time was exactly like the ones I had heard before, down to the explanation of "and you have to futz with them a little bit, and I LIKE that…" Futzing with the bug bots makes them come off more science-y and experimental. You have to work at it, try to make it work, go back to the drawing board, etc. Futzing here seems to be a thing that represents the kind of work done at the hackerspace. Any time we do a workshop with people, especially children, [Jennifer] likes to get them to 'futz' with what they are working on.*

The concept of "futzing" is one that Jennifer likes to bring up often, especially when describing to visitors and new members what it is that makes what happens at the hackerspace special. Hackers futz with things, they "edit" them, they change what needs to be changed so that it works for them, not the other way around.

Drake's PDUs and LED Lighting Tools

Drake worked for a contracting company in town that built software and robotics solutions for the government, and in his spare time he built his own robots. Robotics projects, like many other large-scale electronics projects, consist of a variety of electrical components, each with its own electricity needs. To satisfy these needs, these projects often require power distribution units (PDUs), which distribute the electricity from the power source to match the specific requirements of each component. For his robots, Drake often makes his own PDUs by soldering together the proper components on a custom circuit board. Though each PDU is a one-off (unless a future project requires the exact same kind of power distribution), self-made PDUs can be less expensive and their customizability for specific project needs make them more effective in doing their jobs:

> *Power distribution boards I almost always make on my own because they're usually project-specific. Most electronic projects that you work on don't always sit on a single power source. For example if you have a big robot that operates on 12 or 24 volts, most of the sensors operate on 3.3 or 5 volts, so you obviously can't feed 24 volts or 12 volts to a 3.3*

volts circuit, you'll cook it. So you have to have a way of distributing that power and dividing it, cutting it, or whatever, converting it so that it's useful.

Figure 7. Power distribution units.

Unlike Mike, who values the challenge of being thrifty and creating his own tools even when he does not need to, Drake cares more about saving his time, often characterizing many components as, "cheaper to buy that it is worth my time."

If it weren't my money, then I would always buy. Because there are enough modules out there that you could make it fit, you could make it work. And there are companies who will fabricate individual integrated circuits for you if you told them what you were looking for. If it doesn't already exist, they'll make it. Cost and Speed. If it can be quickly found cheap and delivered quickly, then purchase, but if it's something that's really arbitrary or if it's something I need now and I have parts on hand, build it myself. That's actually kind of a big thing. If I have it on hand, if I have most of the parts if not all of the parts on hand, then I will go ahead and build it myself. But if I have to go hunting, then I'll just purchase something.

Creating PDUs was not a passion project for Drake, it was just done out of convenience. His passion was for collecting high-powered LEDs and incorporating them into unique projects. Sometimes these LEDs would be used in this robotics projects, as decorative lighting, as educational to show off different characteristics of LEDs to anyone who would listen at Null Alpha, or for his experimental hydroponic system.

I do a lot of light mods. Love LEDs, love the colors, love the whole photoelectron effect. I think it's a lot of fun, very interesting. And I learn—through that obsession, I learned a whole lot more about light than I thought I ever would have. There are six distinguishing

units of measurement for light, which a lot of people just didn't know.
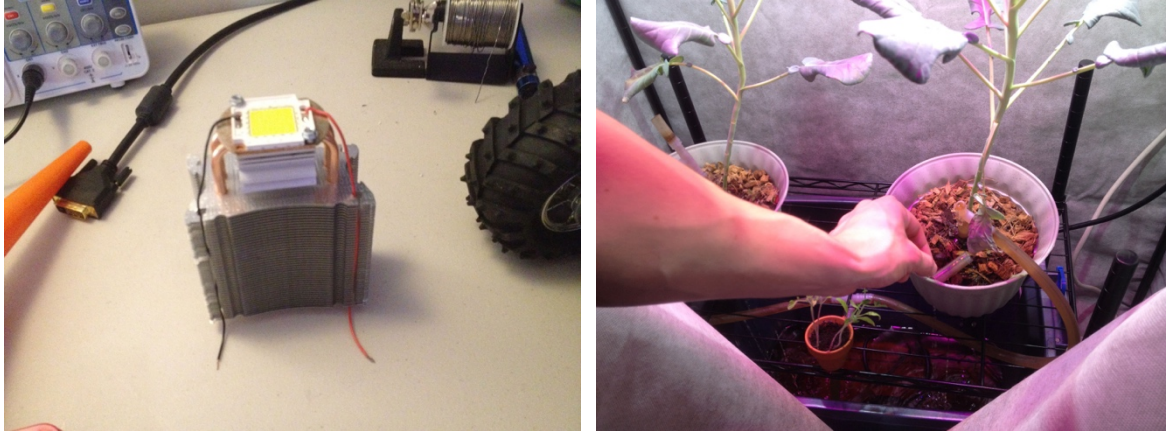
Figure 8. Custom LED lighting system.

George's Power-Generating Bicycle, Metal Pulleys, and Home Electrical Systems

With a background in electrical engineering, George operates a cyclotron during the day and has been tinkering with power generators for decades. His signature project in Null Alpha, an electricity-generating stationary bicycle, has been used locally in several public events as an example of alternative energy sources, and he often shared a story about how he used it once when a snowstorm caused a power outage to generate enough electricity for his wife to telework from home. The bicycle power generator is a stationary bike with a set of pulleys and motors that together generate electricity through induction when the pulleys are activated. George found the bike frame next to a neighbor's trash, and he welded parts of it together with the help from a fellow hackerspace member who owns the welding equipment in the space. George also machined the pulleys that are integral to his bicycle power generator out of cubes of aluminum using the metal lathe and the milling machine, after learning to use those tools from Null Alphas machining expert, Nolan. When I asked if he had experience machining metal before, he said:

> I just went over there and I had never used a metal lathe before in my life and what was it, about an hour or two hours later I've got a pulley. Well getting the bevel of the pulley to match the belt was the hardest part because I don't know anything about this but I found out how to do it and you match the belt here and you set up and match it over there and I don't even know how exactly how I did it but I know I did it but that was great fun.

Figure 9. Bicycle generator and custom gear ratio.

This bicycle generator project was a popular project to show off to visitors, and part of that

is because the story of just going over to the machining equipment and having purpose-made tools

and materials is appealing to many of the visitors and potential new members of Null Alpha. For

several months, members giving tours to visitors had them pedal the bicycle to generate enough

electricity to turn on a light bulb, making the generator more of a show piece or attractor tool

because it was something quick and easy that visitors could interact with. This and other attractor

tools were used to get visitors excited about the hackerspace, even if many of those tools were not

actually used regularly in the space, such as the vacuum former or the soap making kits. As a sort

of publicity stunt, the bicycle generator was carted around to several events around Floraville,

including Null Alpha's maker convention and the Southern Indiana Renewable Energy Network

meeting. George characterized the project as one of his favorites:

> *It is one of my favorite projects. I think the one thing that makes it one of my favorite projects is it's something that people can relate to so I could share it with people. Other projects that I find just as interesting but nobody has a clue what I'm talking about.*

One of George's projects that others seemed to have a hard time understanding was his

home electrical system. George re-wired parts of his house to operate solely from power generated

by his solar panels and stored in a bank of car batteries he keeps in his garage. The wires are all

controlled via a control box in his garage, which he also built. Various lights through his house are

connected only to this solar energy, and would require significant work to re-wire to the grid. As a

result, he and his wife still have lights on even when the power grid goes out. He also built a

charging station that allows him to charge any electronic device that could be charged through a

standard 12-volt car charger, which he and his wife use to charge their cell phones through the

solar-generated power.
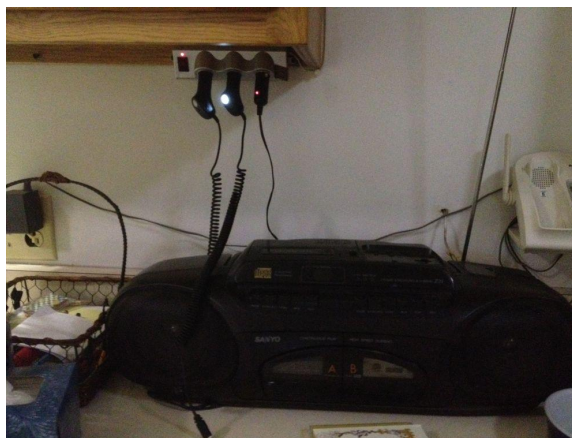
Figure 10. Solar powered charging station.

When I first asked George if I could interview him about his bicycle generator, he asked if

we could do the interview at his home so that he could show off his home electrical system. He

was especially excited to point out how his system was completely his, saying, "You can tell I didn't

get it out of a book. I wasn't following anyone when I built it." Later, during the interview, he

walked me through the electrical system using language that would suggest that he thought this

project could be done by anyone:

> *This goes up to the solar panel and feeds the house. This is a charge controller that I built. The relay is just the switch that connects you to the solar panels or not. This was just something I've cobbled together here on the desk, and it does a measurement of the solar panels and the battery voltage, and if everything lines up right it pops on. This little switch, this light becomes bright because right now it's kind of dim and you hear a little "click." And then the voltage over here starts to rise and you see the current go negative because you're charging instead of discharging. These are the breakers. I thought that was great. I didn't know they made 5 Amp breakers. That is wonderful. DC 5 Amp breakers, and the colors are coded to what is in the house. So if you've got an outlet and it's got a brown dot on it this one kills it. A red dot, that one kills it. And then up here I've color-coded all of my wires as to what are you feeding so there's no question, you know? <laughs> But it was really funny is how much of this stuff I found in the trash. <laughs> So this didn't cost me anything. Well, the breakers cost me like, I don't know, five bucks apiece, but other than that everything was free.*

When asked where he developed this attitude he demonstrates toward setting out to work on a

project without any clear plans about how it will be completed, George said:

> *Gosh, as far back as I can remember I was always taking things apart, seeing how could I make something that I have into something that I want. So like my mom forbid us to have any kind of guns, no BB guns, nothing. But the kids next door had BB guns. I wanted a BB gun. Well, there was just—it was out of the question. So I went out in the woods with my pocket knife, which I was allowed to have and carved a crossbow with all the working mechanisms and everything in it, and loading it up, and firing it off. Much more powerful than a BB gun. <laughs> And I brought it home and my mom said that I wasn't allowed to have guns. No firearms. I was like, "There's no fire. It's bolt action," you know. And but she was going to take it away from me and I told her, "This took me six and a half hours to make. If you take it away, I'll have another one in exactly six and a half hours." <laughs> So it's like she let me keep it. I was like, "It's no sense in taking it away. I'll just have another one by the end of night," you know. <laughs> So I made it my own crossbows fashioned after the 14th century French-- what do they call them? They've got a name for it when it's the French style, but I can't think what it is. Whatever.*

'Laser' David's Sharpening Jig, Push Tools, and Laser Tutorials

David is an application developer who has made several tools specifically for public use in

Null Alpha. These tools were intentionally made from spare pieces he found around the space, and

in David's own words, the tools "*cost nothing but time*" to create. When the hackerspace received

a set of dull chisels for the wood, David created a sharpening jig to attach to the bench grinder,

making it easier to sharpen the wood lathe chisels by holding them at a steady and constant angle.

In building these tools, he focused on getting them to be just "good enough," elaborating:

> *It seemed silly to buy or spend too much time on a more elaborate jig, because we're really not a woodworking shop as much. You know, that's just an aspect. But we're not going to use the lathe super extensively.*

Figure 11. Sharpening jig for the wood lathe.

In his second project, motivated by his concerns for the safety of his fellow members, David made several push tools (i.e., tools that are used to push materials across the table saw) to reduce risk of injury while using the table saw. These push tools mimic commercially available push tools, but they were made from scrap pieces of wood found in the space intentionally to make sure that they would only cost him time to create.

Shortly after these two projects, Null Alpha acquired a laser cutter, which they purchased by pooling personal money and thoroughly researching the laser cutter market at the time. David led the majority of the research on the laser cutter, and was the first to learn how to use it when it arrived, having a list of projects he wanted to complete with it. He quickly became "laser man David," and became the center of any laser cutter related project within the space, from cutting the official badges for Null Alpha's maker convention, to training others to use the machine and being available to answer questions. A passage from my field notes read:

> *[David] has really become the laser cutter guy. Before the laser cutter was here, nobody ever needed his help or asked him any questions, but since we've gotten it there's a line to*

talk to him!

This identification with the laser cutter became more and more strong as time moved on and as he gained more experience, performed many rounds of tests with various materials and cutting power, and trained more people on the tool. In the several instances where the laser cutter would break, he was always the one leading the charge to repair it, even though it was not an official or legal responsibility of his. "Laser David's" case is a clear example of a hacker being identified within a hackerspace by their skill with a tool. While this particular laser cutter was not one that David had built from scratch, it was a tool that he had adopted and made his own by becoming its guardian and by becoming the person through whom others in the space were able to interact with it.

Figure 12. Laser cutting tests and measuring tools.

In his crusade to make sure that others within the space could make the most out of the laser cutter, David laser-cut many tests to demonstrate the effects of its various settings. Many of these were crucial for others' projects, as using too much power or having the laser travel too quickly could ruin the measurements for a project and cause it to fit differently than it would with the proper settings.

Charles and Joshua's Homebrew Radio Equipment

Charles and Joshua are both amateur radio operators (also known as "Hams"). Charles

telecommutes as a developer for a popular operating system, and Joshua is a freelance developer.

Together Charles and Joshua own several portable high frequency antennas known as

"Buddipoles." Charles built his homebrew, modular Buddipole using materials he had on hand by

following the plans created and shared freely online by "Budd W3FF," the inventor of Buddipole.

Joshua put his Buddipole together from a kit he ordered online. Common materials include

stainless steel telescopic whips, PVC pipes of varying lengths, PVC adapters, insulated speaker

wires, electrical connectors, antenna adaptors, alligator clips, and banana plugs, among other

things. These Buddipoles work well on any band from 10 to 80 meters, and operate as a portable

high frequency antenna—a Ham setup that used to be incredibly difficult to achieve as high

frequency antenna are generally stationary, but modified in this case for portability so that they can

be taken on backpacking and hiking trips.

Figure 13. Buddipole.

When I asked Charles why he chose to build his from scrap parts, rather than purchase a kit

as Joshua had, he said:

> *For me this is half of the fun. I could pay three times as much for an antenna that's been*
> *professionally tuned and made and has his seal of approval on it—his being Buddy—yet*
> *half of the fun is actually talking to someone on, you know, across the country and across*
> *the world, on pieces that I've actually built myself. [...] The catch with [High Frequency (HF)*

on the Buddipole] is that it only runs 5 watts. 5 watts with HF is challenging. But then again some people really like that challenge. Operating that radio, under those low power conditions with this home built antenna off camping somewhere you're not going to be able to talk to anyone and everyone, but as soon as you do get a contact with someone, it's all the sweeter, because you know that it's hard and you know that the odds are against you.

Indeed, it was clear that this experience of contacting people miles away on his own equipment was exciting for Charles. During one observation, I helped him construct his Buddipole outside in front of Null Alpha because he wanted to show me how it all hooked up and operated. At this point in time I had just received my amateur radio license after attending his workshop on how to do so, and he wanted to show me a few of his projects. Even though it was only meant to be a demonstration event and many of the conditions for making contact with another radio enthusiast in another state were slim to none, we were able to contact someone from Mississippi, and Charles, grinning, excitedly explained, "That right there just made my whole day. I did not expect at all to make any contact on that frequency in this time of night on this." For Charles, knowing that he had built this equipment made the experience more enjoyable. However, as with Mike, it had not started that way for him but rather as an exercise in practicality:

So building antennas, tweaking antennas designing my own, you know, that's always been a fascination. I think that actually grew from being a broke teenager trying to get into the hobby and needing an antenna on the cheap. So what do you do? I couldn't afford a $100 antenna but I needed something. So I looked into well you can take this wire and if it's the right length and situate it in the right direction it works just as well. So I guess that kind of stems from necessity of cost and kind of like oh, this is really cool. I can accomplish something pretty neat out of something that I've made on my own.

For Joshua, the experience of experimenting with Buddipoles was a way to see what it would be like to be responsible for—and identified with—an innovation in this hobby:

I'm just getting started with radio stuff, so I haven't really built anything that hasn't been built like a trillion times before. So for example, like the place that [Charles] and probably everybody else who's made a do-it-yourself Buddipole-- there's a guy in California-- I forgot his call sign-- but he posted his video to YouTube, and he goes through the whole process of building this. So he kind of started-- he didn't even start the do-it-yourself Buddipole thing. He just made a really accessible and interesting video that shows him making a Buddipole and then making a contact on it that everybody else seems to reference.

My Yarn Swift

After being inspired by watching others in the space create their own tools in the moment and as they needed them, I took a turn by building a "good enough" yarn swift based on a more professional yarn swift I had seen days before in a yarn store. On an otherwise uneventful weekly public meeting at Null Alpha, I told members that I was going to build something to help me organize the tangle of yarn I had accumulated over the years. Several of them jumped up to help propose ideas for how to get it to work and how I could use materials already in the space. Even at the outset of the project, I assumed that I would need to spend time figuring out how to get each of the pieces together, and that this might take at least a few days to track down the most appropriate parts.

Figure 14. Homebrew yarn swift.

The first thing I knew I needed would be something that could spin freely on one side, but stationary on the other. After only a few minutes of discussing this issue with members, we realized an old computer fan would do the trick. George showed me how to rough up one side of the computer fan so that the glue we would need to apply to it would stick better, and David helped me pick through the scrap wood pile to find two pieces of crown molding that could be affixed orthogonally to each other, and then nailed to a spacer which, in turn, was glued to the fan. The entire process took less than thirty minutes, and I was able to re-ball some yarn by the end of the

night. A few months later, David convinced me to show off the yarn swift at the maker convention Null Alpha organized, and he specifically hoped I would be able to excite members of a local knitting club enough to occasionally visit Null Alpha.

Developing a Hacker Identity

In the previous section I presented various relationships hackers at Null Alpha developed with their tools and projects. In this section, I will characterize how these tools or projects can come to represent the individual and her creativity and ingenuity, going beyond the final, built artifacts into issues of identity and self-expression. I will discuss how hackers at Null Alpha developed their identities as "established" or expert hackers through several themes I observed in their tool-making and tool-using behaviors: 1) the development of a tool and material sensibility; 2) the development or shaping of attitudes they had toward the hacking process within the space; and 3) how they established their places within the hacking community, both within Null Alpha and, occasionally, more broadly in the hackerspace and DIY movement.

Developing a Tool and Material Sensibility

My ethnographic fieldwork quickly revealed instances of ad hoc, ingenious tool-making, grown out of makers' agitation and pragmatic concerns for the fact that available tools were not fit-for-purpose—which, as Sennett describes, would, "send the message of clarity, of knowing which act should be done with which thing" (2008, p 194)—but rather they were, for instance, not good enough, too hard to use, overkill, expensive, unavailable, etc. These challenges would lead to a process of impromptu reinterpretation, adaption, and/or improvisation of materials and devices at hand to fashion "good enough" tools for specific purposes. They often were modified versions of familiar tools, built to better fit the purpose at hand, and many were based on plans for similar tools found online through a variety of resources, such as Instructables, YouTube videos posted by other makers, or hackerspace wikis.

The development of a sophisticated sensibility for available tools was an integral part of becoming a hacker in Null Alpha, where this tool sensibility was comprised of: a deep understanding of existing tools and how they could be used; an ability to judge which tools were the most appropriate for the task at hand; and an understanding of the materials and media available to the hackers.

Learning to use their tools

Members of Null Alpha emphasized the need for practice and extensive engagement when it came to developing the kind of skills they had. Nolan's comments, in particular, revealed this when he described his reactions to others' astonishment at his accomplishments and pointed out that for all of his successful projects, "*there's at least a dozen that are not, for various reasons.*" This emphasis on working on many projects as the way to develop as a hacker was present in all of my interviews and was clearly observable through hackerspace activities.

In addition to a general practice of hacking and making, it was clear that knowledge about how to use specific tools was important to members of the hackerspace. I saw this emphasis in the workshops and classes put on by Null Alpha members, as well as in the way tour-givers would focus on the tools and prominent community projects for visitors, but I saw it most clearly in the self-made tools I investigated. To be able to make a self-made tool, a hacker must first have an embodied understanding of the limitations of existing tools. Oftentimes the impetus of tool making comes from the constraints of existing tools, and Drake's tools demonstrated this. Drake rationalized making his PDUs this way:

> *There is no board that's going to do exactly what I need [it] to do. There's not going to be a single board that has the number of pinouts that I need … a good form factor. Building and constructing [one] myself is going to be more beneficial than trying to hack and slash something into my rover.*

Existing tools challenged Drake in that they were not fit-for-purpose, but by thinking with and through the limitations of imperfect tools, Drake was empowered to make his own. Moreover, as summarized earlier, tools are future orienting. While they may lack tooling potentials, these

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imperfect tools nonetheless act as catalysts that activate Drake's intuition and imagination into different possibilities. Sennett (2008) describes these possibilities as "grounded in feeling frustrated by a tool's limits" (pp 209-210), and Jencks and Silver (2013) agree: "In technology, inadequacy, not necessity, is the mother of invention" (p 107). The hackers' abilities to recognize inadequacy in their tools in the first place is part of what makes them hackers, and is a skill they develop through extensive engagement and a deep understanding of their tools.

Learning to judge a tool's appropriateness

When working in a small machine shop environment like Null Alpha, the ability to use specific tools is only half of the battle: knowing which tool to use for the job is an important type of judgment that hackers develop by becoming familiar with the tools available to them, and through them the possible abilities on which they can capitalize. George described his process of creating an impromptu pulley for his bicycle generator as a casual experience: "I just went over there and I had never used a metal lathe before in my life and what was it, about an hour or two hours later I've got a pulley." He made it sound as if the knowledge for creating this pulley just came to him, but I know from my observations that George spent a large part of his time at the hackerspace in the shop area near the metal lathe, where he could watch and engage with Nolan, who regularly worked on the lathe. This experience participating in the shop and observing others' activities helped him develop a sense for which tools were appropriate for which jobs. Even though this was George's first time using the metal lathe, he knew what it could be used for from watching others use it. With this understanding he was able to create his own tool, demonstrating his familiarity with the tools and materials in question, as well as the tool's role in enabling George to be future-orienting: he could imagine the creation of this pulley *because* he knew how the metal lathe worked.

Materials and Media

Intimately related to a tool sensibility is the development of familiarity with a particular material. In the case of the hackers in Null Alpha, metals, wood, plexiglass, and other everyday materials both inspired and constrained their creativity. It can be seen in this data time and again that the process of tool making was very much driven by toolmakers' intimate and deep respect for the media they work with. This is especially at play in Drake's LED and PDU projects, Mike's lock picking tools, Charles' and Joshua's antennas, and Nolan's descriptions of being able to bend a material to his will, where their understanding of the material they work with is necessary in order to benefit from the full functionality of their projects and tools. Toolmakers' understandings of materials, as McCullough observes, do not come from something abstract and theoretical, but is grounded on direct involvement with them, oriented toward "workability and practices" (McCullough 1996, p 196). Nolan's modified RS232 cable is case in point. To connect to the LED marquee, he needed a cable that could create a bridge between their computer and the marquee using the RS-232 communication protocol. Nolan's extensive engagement with—and knowledge of—straight-through cable enabled him to appropriate the technology in this *ad hoc* way.

This familiarity with the material possibilities available to a hacker was especially helpful when it came to navigating the physical environment of Null Alpha. Jencks and Silver (2013) discuss the importance of "browsing" in any information system (p 177), and a hackerspace full of tools and materials can certainly be considered such an information system. Without a sense of the material possibilities available to them, the materials strewn about the hackerspace would be seen as just another mess, instead of as possibilities for projects. As a lock picking enthusiast, Mike was intimately familiar with the material requirements of his tools. The tension wrench he created came from a piece of steel he found on the floor of the space which he then hammered into the shape he needed to complement his other tools. Without the familiarity he developed with his tools and

the materials they were made out of, the piece of steel on the floor would have easily been overlooked.

As with Drake's and Nolan's projects, we recognize in Charles and Joshua's antenna projects—both the buddipole projects and the other antennas they have built over time—that engagement with materials is personal, and the conversations between the toolmakers and the materials (i.e., materials' "talking back") unfold over time. Charles related his experience developing his interest in Ham radio and building his own antennas as a result of being a "broke teenager," demonstrating how his engagement with the materials and understanding of how antennas work enabled him to work within a set of constraints to build his tool and further develop his interest in Ham radio while also developing his identity as a hacker.

Shaping Hacker Attitudes

The skills to actually pick out and use a set of tools and materials are an important part of becoming a hacker, because ultimately hackers make things. However, the personality and the attitude required to really become an expert hacker can be even more important. When asked which skills or processes he relied on continuously throughout his making process, Charles, who grew up making his own antennas for his amateur radio hobby, said,

> It's hard to say 'skills' more than it's—I would say just my nature of curiosity and wanting to tinker. It's not really a skill. It's just a personality trait, I guess. And I would say that I don't go into a situation already having a skill. I kind of walk away from a project or a situation having learned a skill. And that's kind of half of it, is here's something I haven't done before. Here's an antenna I haven't built before. How would I do it? I guess I have basic skills of understanding of a technology but there's a lot of research involved in figuring out okay how does this work and how does it work differently than what I've done before? So skills I guess would be just a basic understanding of technology be it, you know, computer language or software, operating systems or ham radio. And maybe the biggest skill there is just knowing how to research and figure out the skills that I'm missing.

For Charles, making his own antennae was not just a way to get by or be frugal, but was also an experience that played on his personality and could be used to demonstrate that he deserved to call himself a hacker. The adhocist attitude of being able to learn—and do—as he worked centers on his being motivated by practical constraints while also having an underlying confidence in his

abilities to fulfill those constraints. In this section, I discuss several themes that impact the attitude-shaping that took place at Null Alpha, including: how "being practical" was both a project ideal and an identity constraint; how activities in Null Alpha were built around building confidence and teaching members to trust their abilities; and how both implicit and explicit ideals of empowerment and self-empowerment pervaded the hacker culture of the space.

Practicality as an ideal and an identity constraint

For the hackers at Null Alpha, "being practical" was both an approach to and motivation for many of their projects. Jencks and Silver (2013) distinguish between practical adhocism, which they describe as relying on "*ad hoc means,*" with intentional adhocism, or creating "*ad hoc ends*" (p 110). The distinction here is between creating an artifact through a set of ad hoc processes and creating an artifact that represents a purposeful conglomeration of other artifacts juxtaposed in one entity. This dual meaning of adhocism encapsulates the tensions I found in hackers' desires to "be practical" with their projects: in some projects, *ad hoc* means were used to fulfill a practical need or to navigate, overcome, or build on the monetary, temporal, or contextual constraints of a project; in others, *ad hoc* ends were created as *performances* of a practical approach, even if the end result was a project that cost more.

Both Drake's and George's tools and projects demonstrated the incompleteness and limitations of the materials and resources in Null Alpha. However, as tool makers, they had a pragmatic attitude toward such constraints, and in fact, relied on them to give rise to creative expressions. George described a conversation he had with a group of students when he demonstrated his electricity-generating bicycle at a local high school and was questioned about the bicycle's gear ratio, prompting the explanation: "sometimes it's a case where what you have on hand is what you use, rather than going out and buying or whatever." For a tool such as the bicycle electricity generator, a higher gear ratio would have been more effective, but George had to

(and enjoyed) working with what was available, and was at peace with having a "good enough" final product.

With his sharpening jig, David shared a similar sentiment about working within constraints and being at peace with a "good enough" solution, relying on the fact that Null Alpha was "*not a woodworking shop*" to justify his pragmatic approach to approximating the functions of a more professional sharpening jig. To some, tools made with inexpensive materials, scraps, and found objects or even junk laying around in the hackerspace were perfectly acceptable as long as they were made "well enough" or "close enough." In other words, while these self-made tools might not have been perfect, they were nevertheless optimum for the context and means. Jencks and Silver (2013) argue that "approximate solutions are very often the best when requirements are multiple or complex" (p 119), and here we see that multiple and complex limitations, such as a need for efficiency or frugality, can also be met through approximate solutions.

The desire to appear practical also played out as an identity constraint, where pragmatism and frugality were often desired *expressions* of projects, even if the process of obtaining that expression ended with an overall less frugal or less efficient output. This was especially true of the projects that Charles worked on relating to his ham radio hobby. His stories about how he got his start with his hobby, and how he started developing as a hacker, began with creating his own antennas just to be able to participate. But even now that he's older and successful and that barrier no longer exists, he still makes many of his own antennas. For him, having a homemade antenna plays into the *sport* of making and hacking. He said "half of the fun is actually talking to someone on, you know, across the country and across the world, on pieces that I've actually built myself."

Mike also clearly exemplified this identity constraint, going so far as to modify things he had to purchase specifically so that nothing he used looked like something that could have come from a store. In one instance, Mike purchased a lighter and when I asked what he was doing to it, he said, "I got it in the mail, so of course I'm changing it," and he then proceeded to cut and bend a strip

of metal to cover part of the lighter so that he could manipulate its oxygen intake. In these instances, hacking takes on a sport-like quality, one where the points are scored based on the *appearance* of frugality and practicality, even when the process of making these tools and products actually ends up costing the hacker more in the long run. Through participating in this "sport," hackers create *ad hoc* ends, expressing an affiliation with pragmatism and adhocism. As Gauntlett (2011) observes, "the best tools are not merely 'useful' or 'convenient' additions to everyday life, but can unlock possibilities and enable creative expression, which are essential components of a satisfactory life" (p 172). This played out in the processes Null Alpha hackers used to create their tools, where the methods that were "convenient" were discarded for what could result in a more creative expression.

In contrasting cases, however, simply buying the parts for a project can be the most frugal decision, even if the part could be made relatively easily. This approach can be seen in Drake's schema for when to purchase his PDUs. Where Mike said, *"*The thing I have the most of is time, not money" about his decision to make his lock picking tools, Drake offered a different and more nuanced perspective about cost and speed, explaining that he purchases components when they are cheap enough to be of no consequence, and only makes them himself if it would take too long to acquire the right part. In reflecting on and contrasting my experiences working alongside Drake and Mike within Null Alpha, Drake often seemed less driven by a need to prove he was a hacker than Mike might have been. Mike was younger and more eager to appear practical, and his interactions in Null Alpha were overall more performative than Drake's. Drake cared more about the end product and the ideas he was developing, and often cared more about being seen as a scientist and rational or logical thinker than as a "hacker," necessarily.

Confidence and Futzing

Each of the self-made tools I investigated in this study and much of my ethnographic data demonstrated a high level of optimism and confidence on the part of the hackers. Some of this

optimism could be attributed to the tool and material sensibility described in the previous section, but I also see this attitude coming from a demonstration of trust in the hacker's adhocist process, in being surrounded by hacker precedent, and in being encouraged to "futz."

When working on a project, the hackers typically avoided planning out each step of the process (sometimes explicitly and deliberately), relying instead on the belief that they would be able to figure out what needed to be done at each stage of the project. A common phrase to be heard around Null Alpha, especially when discussing possible group projects, was "We're a hackerspace, surely we can think of something." Playing into this trust in their ability to know how to research what they would need to know when the time came was the comfort they had in knowing that their projects were approximate solutions that only had to be "good enough" for their purposes. In fact, an overly meticulous or powerful project could be seen as overkill. Further boosting this confidence in the members was the clear acceptance members demonstrated for failed projects, re-casting them as legitimate and necessary forms of practicing one's skills.

Being a part of the hackerspace and being surrounded by examples of others who dive into their projects head first seemed to be a crucial experience in developing one's own confidence in their hacker skills. Joshua elegantly stated how DIY projects can inspire confidence or encourage those who are new to the maker and hacker scenes:

> *Some people have an intimidated state of mind and they think, "Oh man, it's hard to build your own stuff," and seeing somebody who doesn't know what they're doing at all build their own stuff and being successful might be inspirational. … Yeah, because antennas seemed a lot more mysterious, and now it's really—it's like a measured piece of wire that resonates at a frequency that you need to feed with coax. So if you can do that, then you have an antenna.*

One of the many things the amateur radio community has going for it is a long tradition of 'homebrew'—or home made—technology, which encourages new Hams to build their own tools. This experience with precedent projects carries over into other forms of making and hacking as well, including serving as inspiration by looking at related projects, which I saw countless times as members performed a few quick Google, Instructables, Thingiverse, and YouTube searches to find

similar projects to give them a basic idea to work off of. When Nolan built his bubble etcher, many

of the parts came from ideas he saw in other people's projects. When David built the sharpening

jig, he went through a similar process, and even though he did not end up using a lot of the plans

he saw, they were helpful in his eventual design:

> *We got a wood lathe, and the tools for it were fairly corroded and needed sharpening. I wanted to clean them up and do it mostly right, but also cheap. I found a few sets of instructions and sets of tools that were options on how to do it online, mostly free sites. I did look up different plans for the jigs, but ended up not really using those. I adapted my own based on those and based on the videos I watched.*

Seeing these other individuals create their own tools when they needed them inspired me to build

a few of my own as well, including the yarn swift example. Even though I was not surrounded by

similar yarn swift projects to be inspired by, I had been embedded in this culture of creating,

through ad hoc methods and with pragmatic attitudes, whatever tool I needed to get the job done

as well as it needed to be.

The emphasis on confidence was further established through how hackerspace members

approached maker education for children. Jennifer characterized her favorite part about the bug

bots class she often leads as "futzing," saying "you have to *futz* with them, and I like that." This

idea of futzing referred to tinkering with the bug bots while building them, because they were not

particularly well designed *on purpose* so that the children would have to tinker with them and take

charge of how pieces should be bent and configured to make sure that their bug bot would

actually work well. This contrasts sharply with the kinds of maker kits that can be purchased

through popular websites such as Make magazine, Sparkfun, and Adafruit, where the pieces are

designed to fit perfectly together already, and once all of the steps are completed the project is

finished. Futzing with the bug bots involved repositioning their antennas and wheels to get them to

move in somewhat-straight lines while still being able to change directions when they bumped into

an obstacle. The exercise forces participants to practice physically tinkering with the object they

created, with the hope that they would eventually be able to do so without fear of failure, while

also accepting a certain level of approximation, and learning when to stop "futzing" and just experiment with what they have.

A certain level of confidence is required for hackers to be able to make just for the sake of making, which is one of the characteristics that seems to separate general hackers and makers from more established or expert hackers. When describing the projects he works on, Joshua says, "They're all useful and they all work. [But] I haven't gotten to the point of just making things just to make them, because I don't really know enough yet. Though I'm almost there. I have a couple projects in the works that I haven't made yet that probably won't be all that great or useful." Once makers have developed enough trust in their abilities, either because they have learned to adopt this adhocist attitude full-heartedly or because they have started to view themselves as experts with the tools and materials they work with, then they start to see themselves as established hackers. Drake related the experience he had when he realized exactly what it was he already knew how to do with his robotics projects: "Everything from there, from robotics on, has just been an extension of that mindset, that holy crap, I'm empowered. I know how to learn the stuff. I know a lot of this already. Why not just take it seriously?" For Drake, realizing he could do these projects already because he knew how to learn how to make these projects was a big step toward becoming an established maker.

Ideals of Empowerment and Self-Empowerment

Empowerment and self-empowerment are often core justifications for joining a hackerspace. Pragmatically, the spaces and communities centered on making, hacking, tinkering, and DIY activities can be described as empowering environments simply for providing access to tools and infrastructures typically unavailable to individuals. Socially, they empower through a focus on encouragement, through an acceptance of messy and unfinished projects, and through the availability of expert amateur help. All of these influences shape the hacking experience and push individuals toward regaining control of activities they often do not realize they have given up to the

jurisdiction of industrialization. The front cover of the Whole Earth Catalog, often cited as one of

the earliest catalysts of the current DIY and maker movements, uses the following quote to inspire

people to actively empower themselves:

> *"We are as gods and might as well get good at it. So far, remotely done power and glory—as via government, big business, formal education, church—has succeeded to the point where gross defects obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing—power of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the WHOLE EARTH CATALOG." [the front page of the Whole Earth Catalog cited in Turner.]*

Being able to even *have* the idea or desire to create one's own tools is itself a form of

empowerment. The creation of tools is often considered to require a kind of precision that can only

be obtained through industrialized practice, but as can be seen in the hackerspace it is completely

acceptable to adopt a "close enough" attitude so long as the tool can adequately perform its

intended functions. The hackerspace provides an environment where this kind of thinking can take

place. Where realizing that the tool *can* be homemade, and that *you* can be the individual who

makes it is even a possible frame of reference from which to approach a problem. The following

quote from Drake elaborates on this idea:

> *The entire maker movement is wonderful because it's empowering the individual. 3D printers—right now it's kind of an illusion. People aren't going and printing their own brackets and their replacement parts, handfuls of people are. It's not really revolutionizing the manufacturing world, but … [it's] making people realize that information is readily available. Look at this Internet that we've had for the last 20 years. It's constantly getting more and more information dense and there are places where you can go to get distilled quality information. The more people are realizing that, the more people are becoming self-empowered, and the more that are thinking for themselves. That's what I've noticed with the DIY maker movement is that people are becoming more self-empowered. They want to learn more. People who haven't been to school for 20 years are like, 'oh my gosh this is really interesting,' and they're reading about things that they could've learned in college, but now they're readily available thanks to the Internet, thanks to a lot of online courses that are free, thanks to books that are cheap and people are actually going back to the library to find books.*

In my ethnography and interview data, I have seen this relationship as primarily influenced by the

hacker's attitude, which is affected by the physical environment in which hacking activities take

place, as well as the culturally inscribed philosophy of hacking that is enforced by the hacking community. The combination of these factors results in an empowering belief in one's own abilities. This belief is made visible by examining how the hackers I interviewed take their relationship with technology for granted, using hand-waving explanations like, "I just cobbled this together" to describe a process that, in fact, required a deep understanding of the materials and functions required. Hackers seem to take as given that they will need to learn new things to build their tools, and this is usually seen as an *incentive* for building the tool in the first place. By being a part of a hacker community, hackers are constantly exposed to a contagious interpretive lens that involves looking at almost every situation as an opportunity to make or learn something. When I asked many of my participants how they even knew that they *could* make the tool they made, they did not know how to answer the question because the philosophy of making, taking apart, tinkering, repairing, and appropriating had become so much a part of their identity that it took them some effort to distance themselves enough from their behaviors to reflect on the question.

Within Null Alpha, the practice of creating one's own tools can be seen as part of an overlap between two takes on how the idea of hacking and making has evolved over time: the modern maker movement, with a focus on democratized technological practice, and the more historical DIY and craft movements, which focused less on new technologies and more on developing practical skills while also valorizing the "human touch" (historical craft movements were, after all, anti-industrialization). The contemporary maker movement often centers on modes of production that are newly available to non-industrial settings, such as 3D printing and laser cutting, and how access to these emerging technologies is empowering individuals and shaping their interactions with technology. More traditional craft and DIY practices offer a different view, linking these trends more with self-empowerment than with empowerment through the democratization of technologies, and characterizing the ability to build and shape our world as not limited to the abilities afforded to us through our access to infrastructure, but as a capability we

actively develop through our practices. On one hand, we see an account of individuals being enabled through the work of expert professionals; designers and engineers allow us to be empowered by providing tools for us to use. On the other, individuals are assumed to have more agency; people build tools and solutions for their own problems. Null Alpha, and many hackerspaces like it, embody both the contemporary and the more traditional maker culture trends, allowing members to treat it as a machine shop, as a fabrication lab, or as an interesting blend of the two depending on the comfort level of the individual and the projects she has in mind. This provides an environment for members in which exploration is encouraged, mistakes are fun instances of embodied learning, and where hand-made projects and "proper" hacks are the pinnacle of creative expression.

Earning one's place in the hackerspace

At the beginning of my ethnography, the hackerspace seemed to be very tool-focused, with a constant emphasis to visitors about what tools are available in the space, what workshops they could take that would teach them to use certain tools, and which members were experts on which tools. One of the ways I saw the importance of this overall tool sensibility was through how the hackers were identified within Null Alpha by the tools they could use and the skills they had. Many of the members were introduced to visitors through a description of their capabilities, projects, or which tools they owned in the space. For example, George was introduced as an electricity expert and through his bicycle generator project. Charles as a Ham, Drake as a roboticist, Mike as a lock picker, and David as "laser-man," because of his acquired expertise with—and his *de facto* authority over—the laser cutter. These tools were identifiers for individual hackers in the hackerspace, and the hackers were reflexively seen as tied to these tools. As a result, these individuals in the space were also cemented as "established" hackers, because they clearly and demonstrably contributed some level of skill to the overall culture of Null Alpha.

It seemed that it was necessary, in order to consider oneself a hacker, to be able to contribute such a skill to the space, and to be known by that skill. However, having spent almost two years with them, a different social understanding of the space emerged: Null Alpha was much more concerned with providing a social atmosphere for its members, where they could relax and spend time with each other, where they could work on projects that fail without fear of judgment, and where they could learn to engage with their materials and tools on a deep level, both through hours of practice and through learning experiences set up by more experienced makers. The members worked actively to share their expertise and knowledge with each other, either through advice on individual projects and problems as they came up, or through creating educational opportunities in the form of workshops, classes, or shared interest groups within the hackerspace. More expert hackers—with developed tool and material sensibilities and a growing demonstration of experience and expertise—acted as mentors for other hackers. Sennett (2008), citing Harper's *Skill and Community in a Small Shop*, discusses the role of "sociable experts" and their ability to become mentors for other experts, enabling a transfer of knowledge that can otherwise be quite difficult to perform. I saw such transfers of knowledge in the hackerspace community time and again in my observations. For example, in the process of building his bicycle generator, George relied on help from other members to weld parts of the frame together and to learn how to use the metal lathe. I also found this transfer of knowledge to often be tied up in expressions of care for other members: to express his concern for other members' use of the table saw, David built several push tools not just so they could be used for the table saw but to remind other makers to use safety tools in the first place.

Developing this experience with tools and media helps solidify one's identity as a hacker, but can also act as a barrier if this level of understanding, practice, or involvement is not reached. John was a regular visitor of the hackerspace for a few weeks, and even eventually became an official member, before he suddenly stopped showing up. John had a hard time seeing himself as a

hacker, and commented once while looking at one of the products of the machining workshop during a visit, "I need to get in on this, I don't know how to do anything. Where do you have a list of all the classes?" Shortly after this comment, John stopped coming to the space and stopped paying dues. His lack of a connection to the larger tools and their capabilities was a barrier to *feeling* like a hacker that he was not able to overcome in his short time at the space. It is possible that John would have been less intimidated by his lack of experience if other members had made it clearer to him, as they had with other new members, that none of them started out knowing how to use these tools or what to do with them either; they developed those skills over time through practice projects, prolonged engagement, and with a "good enough" attitude toward their finished projects. In the end, none of the members were able to make John feel comfortable in the space, because they did not pick up on his need to be told that he was fine as he was.

Conclusion

In this chapter I have presented one kind of hacker out of many possible variations, focusing on the process these individuals go through to develop and cultivate their hacker identities. Three concepts that stand out in my data as primary drivers of the formation of a hacker identity are: the development of a tool and material sensibility that relies on an extensive engagement and practice with tools and materials to learn how to use them well, how to judge which tools are appropriate for which situations, and to understand how to use available materials appropriately; the cultivation of an adhocist attitude, which involves learning to trust one's intuitions and judgments through a maker process and adopting practical approach to project building and learning; and developing a sense of belonging within the community of hackers. These characteristics set "established" makers apart from the more generalized kind of maker, who can adopt the identity after their first Instructables walkthrough or the first time they learn to use a sewing machine. What I have found is that the process of becoming such an established hacker seems to rely less on inherent abilities, skills, or intelligence per se, and more on adopting an

outlook about one's agency. To instill such a creative sensibility, along with the practical skills to act

on it, appears to be one of the primary purposes of being a part of a hackerspace.

CHAPTER 5: MAINTENANCE AND CARE PRACTICES

Technologically-focused communities of making—including hackerspaces as well as maker spaces, fab labs, tech shops, and many others—have been at the center of attention in popular, business, political, and academic research circles in recent years. Within HCI research in particular, these spaces seem to carry the promise of new forms of computer use, education, innovation, and even ways of life. In the West, and especially in the United States, the manifestos of these communities show strong elements of a neoliberal ethos that prizes self-determination, tech-savvy, independence, freedom from government, and suspicion of authority. Missing from the set of values these communities often espouse are the values required for these groups to function as communities, such as collaboration, cooperation, and interpersonal support. In the previous chapter, I discussed the tools, skills, and practices that I found in Null Alpha. In this chapter, I will discuss the analysis my collaborators and I conducted, through my ethnographic data, that focused on understanding and making visible the community maintenance labor that helped Null Alpha support the practices that make these communities so interesting to those who join them, as well as to popular, business, political, and academic research circles[6]. Specifically, I will discuss how the hacker ethic that develops in these spaces entails a complex negotiation of both the espoused neoliberal and libertarian ethos, as well as an ethos of care that is often hidden and overlooked.

The research on making in HCI in recent years represents an agenda dedicated to developing an understanding of maker culture as a sociotechnical practice and user experience. These include the exploration of the process of becoming a "maker" (as in the previous chapter), the expression of that subjectivity through interaction with materials and participation in a situated maker community, as well as the role of a more generalized maker ethic rooted in the movement's history. In the rest of this section, I present an account of maker and hacker ethics and I discuss the

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[6] This chapter is based on a published paper: Toombs, A., Bardzell, S., & Bardzell, J. (2015). The Proper Care and Feeding of Hackerspaces: Care Ethics and Cultures of Making. In *CHI'15: Proceedings of the 2015 CHI Conference on Human Factors in Computing Systems.* New York, NY: ACM Press.

impact this seems to have had on the majority of research in this area. I then introduce what I

mean by community maintenance practices, and discuss how the concept of care can be used

generatively to research these practices and reveal the often-neglected care labor and maintenance

work that is inextricably a part of what it means to participate in such communities. In the

following section, I describe the community maintenance and care practices I saw and experienced

in Null Alpha, organizing them via Dennis' Typology of Care-in-Action (2003). In the final section, I

discuss the negotiated ethic in these spaces more thoroughly, accounting for how care, while often

ignored or neglected in this predominantly libertarian atmosphere, does much of the work of

helping this particular community succeed.

The Espoused Hacker Ethic and Related Research

Existing literature on hackerspaces, hacking, and making culture reveals much about the

ideologies and ethical stances that support maker and hacker cultures. Hacker ethics have been

described in various accounts ranging from radical hacker activists with a mistrust of authority, a

need to free all information, and a devotion to self-reliance (Levy, 2001) to communities of interest

seeking to democratize technological practice in more peaceful ways (Tanenbaum, et al., 2013).

These ethics and ideologies, in their various forms, are visible in mainstream writings on

maker culture. The *Hackerspace Design Patterns* presented on hackerspaces.org—a central

resource for those engaging with hackerspaces—are meant to describe what it takes to create and

successfully run a hackerspace (see Appendix B). The initial construction of these patterns can be

traced back to the 24th Chaos Communication Congress in 2007, also known as "the European

Hacker Conference." Their descriptions are geared toward maximizing individual anti-authoritarian

interests, with only small nods—focusing primarily on infrastructure or collecting strong

personalities—toward serious discussion of what it takes to build and maintain such a community.

Instead, they prescribe simplistic methods for resolving conflict, such as commanding others to take

care of certain actions like taking out the trash or throwing away others' belongings that are in the

way, and they diminish the concerns of others by calling out what is or is not "pointless discussion." Though it was not very common, these hackerspace design patterns were occasionally referenced by members of Null Alpha when discussing community issues (these patterns were much more commonly referenced in the listserv discussions, which I will present in the next chapter).

This espoused ideology seems to be further reinforced in the way that these communities are often studied or discussed. It is common for much of the work on making and hacking in HCI, for example, to focus on individual makers and their skills, which falls in line with this espoused ideology fairly well, but cannot explain the everyday, mundane labor required for a *community* of makers to persist. Such studies, instead, have focused on the individual creativity and appropriation skills of makers (Rosner & Bean, 2009; Tanenbaum, Tanenbaum, & Wakkary, 2012; Wakkary & Mastri, 2007, 2008); maker communities as sites where people are taking up and working on visions of the future through HCI (Lindtner, Hertz, & Dourish, 2014); the expert-amateur and empowered statuses enjoyed by individual makers (Bardzell, 2007; Grimme, Bardzell, & Bardzell, 2014; Kuznetsov & Paulos, 2010; Pace, Toombs, Gross, Pattin, Bardzell, & Bardzell, 2013); making as an educational initiative (Buechley, 2010; DiSalvo, Nourbakhsh, Holstius, Akin, & Louw, 2008; Mellis & Buechley, 2012); the sophistication of the material engagement required for making activities (Bardzell, Rosner, & Bardzell, 2012; Jackson & Kang, 2014); and the specific tools or methods used by makers (Bardzell, Bardzell, & Toombs, 2014; Mellis, Follmer, Harmann, Buechley, and Gross, 2013; Mota, 2011). In Neil Gershenfeld's book *Fab* (2007), his mainstream publication on maker culture and the emergence of FabLabs, he discusses the role he played in helping to democratize the manufacturing process for individuals in select communities around the world. *Fab* has similarly been criticized for focusing too heavily on the tools and materials of these kinds of spaces (in Gershenfeld's case, FabLabs), and not enough on the nature of the community involvement required for them to be successful (Kohtala & Bosqué, 2014). These accounts, and

others like them, fall in line with the espoused neoliberal libertarian ideology of individualism and self-reliance often found in hacker culture (Maxigas, 2012).

Hacker and maker cultures are often discussed as a monolithic entity that contains within it any act, identity, or community that can be loosely tied to any of a number of activities from hacking, tinkering, repair, construction, and sometimes even design. Scholarship on cultures of making is beginning to address concerns of the *actual* inclusivity of these cultures, as well as the plurality of maker subjectivities and participation (Ames et al., 2014). Studies of many such local contexts have taken place in the past few years (Bardzell, Bardzell, & Toombs, 2014; Grimme, Bardzell, & Bardzell, 2014; Jackson & Kang, 2014; Lindtner, Hertz, & Dourish, 2014; Rosner & Bean, 2009; and Toombs, Bardzell, & Bardzell, 2014). These pluralities supplement the generalized, national-level understanding we currently have about what it means to be a "maker" by providing an account of how making is performed by individuals in specific contexts. HCI research benefits from this kind of work through a deeper understanding of cultures of making, contributing to the discussion of the plurality of maker subjectivities as well as opening up the conversation to how maker communities and maker cultures are sustained.

Some HCI research on making and hacking inadequately explores the nature and significances of maintenance work, focusing on the hacking, making, repairing and other forms of collaborative work, but complicitly following the hackerspaces themselves in obfuscating the ways that interpersonal care is as constitutive of the hacker identity as other key components (e.g., forms of labor and practice; attitudes towards authority, information, and materials). In exploring this community maintenance work, I am able to discuss the ethic in place at this particular hackerspace—and likely others—as a *negotiated* ethic that complexly includes both the espoused libertarian ideals of individualism and independence that underlies hackers' self-image *and* the hidden-yet-enacted care ethic ideals of interdependence, support, and community.

Community Maintenance Practices and Care Ethics

This chapter continues an agenda of bringing to light the multiple subjectivities of hackers and hackerspaces by investigating the maintenance work needed to run and support such communities. The social community of Null Alpha is built around a productively negotiated ideology between "hacker ethics" and care. This addresses the gap between the espoused values of these spaces, which foreground autonomy and independence, and the values that community participants are required to enact for the community to be successful, such as collaboration, cooperation, and interpersonal support. In other words, Null Alpha was not merely a physical location where hackers happened to work, but a community of individuals who saw hacking and being a member of a hackerspace as a solution to their social needs. I refer to many of these less explicit practices as "community maintenance practices," because they are actions that are teleologically oriented toward the success of the hackerspace as a social group.

In addition to providing an account of these community maintenance practices, this chapter also demonstrates how an ethnographic analysis through the lens of care can provide a fuller understanding of the sociality of hackerspaces, which likely applies to such community spaces more generally. Specifically, a care perspective can render visible and help analyze *on the ground* community maintenance practices, which are often invisible, tacit, or neglected. A discussion of care can also make sense of the tension between the espoused and enacted values in this space, explaining why many of these caring actions work precisely *because* they were tacit.

The analysis this chapter is based on was conducted in two stages. In the first stage, ethnographic data was categorized using Dennis' (2003) three-part typology of care. Dennis' typology of care aligns specifically with the metatheoretical framework I employed in my hackerspace studies (please see Chapter 3 for a more complete account of this metatheoretical linkage), and represents one of the only operationalized frameworks available for an empirical study of care-in-action. I used Dennis' typology of care-in-action to find patterns in the acts of care

I studied, enabling me to then uncover the normative system structures in place that made some acts of care possible, while preventing others (2003).

This 3-part typology of care helps to uncover the normative structures behind enactments of care by categorizing acts of care as overt-explicit, overt-implicit, or covert-implicit, allowing for a consideration of how acts of care are conveyed and interpreted. The first qualifier, which distinguishes between "overt" and "covert" care, describes the extent to which participants recognize the communicative act as care in a direct sense. The second qualifier, "explicit" or "implicit," refers to the meaning-imparting strategies of the enacted care. The first, *Overt-Explicit Care*, is immediately recognized as care and responded to accordingly, such as when one holds the door open for someone whose hands are full, and that person then responds with a smile, nod, or a "thank you." The second, *Overt-Implicit Care*, describes caring actions where the fact that these are acts of care is not foregrounded in the interaction. An example of this is joking with a loved one after an argument, where the primary purpose of the joke might actually be to establish mutual forgiveness. Finally, *Covert-Implicit Care* is care that would be undermined if it were to be immediately recognizable as care by the care receiver. Letting a child win at a game is an example of this, where the actor and others recognize this action as one motivated by care for the child, but were the child to recognize this care, its intention would be undermined.

Once data was collected under each of these three types, my collaborators and I used concepts from care ethics as an interpretative lens to explicate the actions within each type. As introduced in chapter 2, care ethics engages with the ethical, moral, and value implications of care, and has come to represent an epistemological angle on ethics that focuses on the interdependence between people (Gilligan, 1982; Noddings, 1982) and the resulting moral duties that come from that dependence (Collins, 2015). As care ethics literature begins to filter into HCI and related fields, it is often used to characterize the responsibility of designers (e.g., Light & Akama, 2014), who are increasingly creating the means through which we enact our sociality as interdependent beings in

specific contexts. In this chapter, I present a more empirically-based account than is typically found in such research (both in care ethics literature more broadly, and in incorporations of care ethics into HCI-related fields more specifically).

<div align="center">**Care in the Hackerspace**</div>

In this section, I present and discuss the care work I saw in Null Alpha. I identify intersubjectively valid acts (that is, acts that are recognizable by members of this community) of care, guided by my experience as a participant in this particular community of practice. I then analyze the data using Dennis' typology of care: overt-explicit care-in-action, overt-implicit care-in-action, and covert-implicit care-in-action (2003).

Overt-Explicit Care-In-Action

Overt-Explicit care is recognizable by the participants present for its enactment. The majority of the overt-explicit acts of care in Null Alpha involved donating personal resources (e.g., time, money, bodies, and skills, etc.), teaching others how to use a specific tool, or attempting to "reward" individuals for doing other kinds of care or community maintenance work. Null Alpha regularly organized workshops that were open to the broader community, and these workshops were primarily useful for Null Alpha in further promoting its image and encouraging more people to show up, get involved and interested, and hopefully sign up as dues-paying members. The more dues-paying members Null Alpha had, the more likely it was for them to be able to pay their bills, with leftover money being used to purchase more equipment for the space. The workshops occasionally had a cost associated with them, but when the cost covered more than the price of the materials consumed, the extra money was almost always placed directly into Null Alpha's accounts. When members volunteered to organize a workshop for the space or to help run a workshop organized by another member, they were donating their resources toward maintaining the space and helping it remain afloat.

This motivation extended to other forms of voluntary work as well, including: cleaning the space when it got cluttered or dirty; scouting for larger locations for the group when they began running out of space for more tools or more members; leading and assisting with the physical construction of walls when the new location was acquired; and assisting with the transfer of thousands of pounds of tools. As with leading a workshop, members performed these tasks to maintain the community. Others recognized these acts as donations as well, and some members explicitly reminded others that such donations were not mandatory, and thus were especially appreciated.

At least one attempt was made while I was a member to establish a tangible system through which these acts of care could be "rewarded" through a gamified system of virtual badges. In my time with Null Alpha, I earned the "event volunteer" and "support crew" badges for various efforts around the space. The "support crew" badge was particularly interesting because it tried to turn ownership of shared chores in the space into an achievement. Its description read:

> *Awarded to people (both members and non-members) who regularly take ownership of chores in the space. From taking out the trash & recyclables, cleaning the toilet, to maintaining the RFID system, asset tagging system, and other technical infrastructure. Can also apply to people who maintain a shared tool like a 3D printer or the Mill or an 'area' like the ham radio table.*

Awarding these badges was its own kind of overt-explicit care, and was meant to signify the appreciation of another's actions. However, these badges did not catch on and were eventually ignored. Had they continued, it would have been interesting to see how they affected the way Null Alpha members viewed the acts of care for which they were being rewarded. Would the badges have eventually cheapened these activities by turning them into achievements? Would chores and other caring activities not included in the badge system, such as covert acts of care or care enacted implicitly, have been left to the wayside or, perhaps, awkwardly given their own badges?

Beyond actions motivated by the advancement of the hackerspace as a community, I also found instances of overt-explicit care-in-action directed toward individual members or visitors. As

Null Alpha was a potentially dangerous environment, this sometimes took the form of concern for bodily wellbeing, such as when I attempted to assist Greg, an early-thirties software developer, when he sliced his finger on a milling machine (to which he replied "I'll just put some superglue on it"). However, the majority of the overt-explicit care in this space took the form of a member showing someone else how to use a specific tool. In the previous chapter, I discussed how the use of a tool could become a part of hackerspace members' identity. The members who were most closely identified with a particular tool were often designated as the instructors for its use. When a member or visitor asked for assistance with that tool, others delegated to the particular member "in charge" of that tool. That member often did not see taking on this instruction as a chore. By passing on their skills to another person, they were able to simultaneously perform care and reinforce their identity as both a benevolent person and as a person skilled with that particular tool. Nolan, who I introduced in the previous chapter as a *de facto* leader in the space, said this about getting to help people:

> *I really like to see someone be able to work on their own after I've helped them, and so I'm still on the phase of trying to do that. I don't know, I mean, I think I'm just kind of a run-of-the-mill geek. I know a little bit about a lot of things but not a lot except my certain specialty areas. I'm very glad that I've been able to be helpful to a lot of people in a lot of different areas.*

For Nolan, helping others become more independent fell in line with the ideals of what a hackerspace should be. Sharing their skills with others is one way that hackerspace members explicitly care for individuals, and thereby further the ethos of care in Null Alpha. In this space, overt care that was explicitly enacted was acceptable when it was motivated by a desire to teach, to learn, or to participate in activities that directly benefited the community. These caring acts demonstrate the responsibility of hackerspace members to care for each other and for visitors, and also highlight the difference in competence to enact care between members. It was much less common to see overt care that explicitly addressed one's identity as a hacker, or one's subjective state. These caring activities were more commonly enacted through implicit meaning structures.

Overt-Implicit Care-In-Action

Overt-implicit care-in-action refers to "the caring act that is clear and recognizable among participants, but the mechanism through which the care is enacted is implicit" (Dennis, 2003). In other words, the act is not directly pointed out as care, but others can recognize it as care. This type of care was most evident in how the members welcomed visitors to the space, and in the community's administrative structure.

In welcoming visitors to Null Alpha, the act is recognizable as care by both parties, but the fact that it was a caring act was not foregrounded in the interaction. When people looked unfamiliar, members would often go out of their way to welcome them and show them around, or would at least make sure the unfamiliar faces were directed toward someone who could give them a few minutes of their time to help them feel welcome. The space was open once a week to the public, but there was no formal way to schedule visits or tours, so it was up to the members to recognize when a tour was appropriate or needed. Helping visitors feel welcome was important for Null Alpha for several reasons: first, because visitors could eventually become dues-paying members who would help sustain the community financially; second, because visitors who felt comfortable might invite their friends, would stick around and hang out, and would open up and talk about their projects, skills, strengths, and weaknesses. These welcoming acts became especially apparent when visitors appeared to be particularly uncomfortable or as if they might feel out of place. Every member of Null Alpha was Caucasian, and all but a handful were male, middle-class, educated, and proud of their identities as "nerds." Every once in a while, someone who did not fit that description would show up, and in those instances members would usually go above and beyond the call of duty to show them around the space and to make sure that someone was talking to them at all times. In one particular instance George, of power-generating bicycle fame, devoted an entire Wednesday public meeting night, which he usually spent catching up with his friends, chaperoning a middle-aged PhD student from Taiwan and making sure that she became familiar

with the space and was introduced to all of the other members. In regular meetings at Null Alpha, members addressed their lack of diversity and always came to the same solution: to try to treat everyone equally, and to be especially welcoming to new faces. This was problematic in its own ways, but it showed that the members recognized their diversity problem, and actively took steps to address it.

Overt-implicit care-in-action was an important part of helping members feel like they fit in with the community. This sometimes came in the form of complimenting or legitimating another's projects, usually by calling it "badass" or "a proper hack." This was especially apparent for projects created for the space, like when "Laser Dave" made badges that included functioning gears using the laser cutter in order to improve on the marketing of the space during a maker conference Null Alpha organized, or when Nolan hacked together a series of projects in the space so that a disembodied voice could greet members by name as they walked in. These encouragements helped validate members' hacker identities, and encouraged members to believe in the legitimacy of their projects. Without even these bland encouragements, it would have been easy to become self-critical of one's projects and start to disconnect with the hacker community.

These acts of care did not necessarily center on activities specific to Null Alpha. Other examples included helping members feel like they are funny by laughing at their jokes or participating in sharing funny stories; being playful with each other, such as calling each other deliberately by the wrong name (which at one point became a running inside joke among members); and discussing issues from work or home that did not directly relate to Null Alpha or the activities taking place there. These types of activities helped people feel like they fit in as part of a social group that just so happens to also build, tinker, and hack things.

The administrative and organizational structures of Null Alpha also worked to help members feel a legitimate stake in the social group. Null Alpha operated through a flat hierarchical structure, and was emphatically a consensus organization. Members of the board were quick to

note that board duties were more of a chore, and that they did not have—and did not want—more power over how the space was used than anyone else. In the espoused organizational philosophy of the space, all dues-paying members had an equal say in how the space could be used. Although it was not hard to find instances when some members really did have more power than others, they worked to sustain an egalitarian atmosphere. When a topic for discussion was large enough to impact how the space was run, such as when searching for a new location, the members were called in for a vote. Each time a vote was held, members were reminded that this hackerspace was not a democracy but a consensus organization, and all members had to agree before the space could move forward with a decision. Just after one such meeting, Jennifer, Calvin (early-40s, male, software developer, and another board member of the space), and Drake were discussing just how hard it was to keep a group going this long as a consensus organization without falling back on other political structures:

> Jennifer [to Drake]: you don't realize how hard it is to run a consensus organization, and we do it so well. So many [other consensus organizations] fail early.

> Calvin [to Drake]: And we've had a couple of tough votes too, [we] haven't just been coasting!

The focus on consensus in this social group created a systemically-enforced level of respect and care among members and between members and Null Alpha as an institution. To reach consensus, as opposed to unanimity or majority agreement, the members had to be willing to put aside selfish motivations they might have in order to benefit the collective.

The physical organization of the space also systemized care. The way the tools in the space were made available to members helped promote a feeling of collectivity. In this hackerspace, very few tools were actually owned by the space itself. Instead, members donated their tools, which were organized through Null Alpha's asset tracking system. In hackerspaces where the organization owns the majority of the tools, becoming a member can feel like buying into a service. With this

hackerspace's collection of tools that belonged to individual members, it felt more like buying into a community of sharing.

These overt-implicit acts of care were often used to solidify a feeling of belonging or a welcoming atmosphere. They were recognizable as caring situations, but if they were made more explicit they would have been less effective. It would have felt insincere, or even creepy, if a member approached a visitor and told them "I am going to show you around the space so that you will feel comfortable here." But the action itself was recognizable by others as an implicit form of care.

Covert-Implicit Care-In-Action

With covert-implicit care, caring acts "must hide in the discourse in order to avoid undermining [their] own caring potential. Covert Care-in-Action works off the same pragmatic structures as Overt-Implicit Care-in-Action, but its caring interpretation is masked or left unsaid" (Dennis, 2003). These acts of care are only known to the care-giver, and not by the care-receiver. If the care-receiver were to recognize such an act, it would diminish its effectiveness. In this social group, these forms of care were evident in interpersonal communication among members, and in the physical environment.

A large part of being a member in this hackerspace involved listening to other members "geek out" about their pet projects or favorite topics. This type of listening, even when interlocutors offered nothing more than bland encouragements and feigned interest, helped validate one's interests and hobbies. This legitimation of interests then established a sense of belonging and fitting in to Null Alpha, and set it up as a worthwhile social endeavor. The style of active listening I observed in Null Alpha seemed to be uncharacteristic of what one would expect in such an environment so steeped in "geek" culture. When discussing what it is like to be a new member to the space who was still feeling out the social interactions there, Justin (mid-30s, male,

stay at home dad, Caucasian) shared a few thoughts on what made the space feel surprisingly

welcoming:

> *I've been impressed, and this has come to mind a couple times, [with] how many questions I'm able to ask, and some of them seem very very simple, and I've yet to have someone look at me, like 'you don't know what that is?'…Everyone has been so willing to share what they know or help me figure out how to find the answer that I'm looking for without going 'oh, you don't know that?' or 'you have never done that?' it's so, I do see it as it's a support and its also kind of inspiring.*

This same subject came up in a separate interview with Calvin:

> *It can be a little intimidating because, you know, geeks aren't always socially sensitive. So you might occasionally have a situation […] where people don't mean to offend you, and be like 'oh you don't know that?' but I haven't really seen that much here, I think people are pretty nice.*

It was important to create an atmosphere where members could feel safe being vulnerable and

exposing their weaknesses and the gaps in their knowledge. Covert-implicit acts of care enabled

this kind of vulnerability among members, where they could be accommodating and helpful

without calling attention to that vulnerability.

A common example of covert-implicit care-in-action was in how the members often

downplayed their own expertise or their own achieved levels of skill by presenting almost any

activity as one that "anybody can do." This typical interaction seemed to be in conflict with a desire

to show off one's skills and abilities, which would be more typical for a social situation actually

governed by values of independence or "geek" norms. Central to this tension was a desire to care

for one's interlocutors, students, and co-hackers. On the one hand, hacking should be impressive

because for some individuals that is what makes it an endeavor worth pursuing. On the other

hand, hacking cannot seem too difficult or one risks alienating potential members. Nolan and

Jennifer were constantly downplaying their own expertise, which helped make them more

approachable and inspired visitors and new members to take on more challenging projects by

alleviating the intimidation that would have accompanied being surrounded by a group of people

who presented themselves as elite hackers.

The physical atmosphere of Null Alpha also contributed to this sense of community through covert-implicit acts of care on the system level. The space had few doors that locked, other than the front door and the donation boxes. The refrigerator, which was often stocked with soda, beer, and bottled water, as well as a stash of chips and candy, were left unattended and subject to the "honor system," where members were asked to donate a nominal amount of money to help keep the refreshments stocked. This assumption that visitors could be trusted in the space helped people *feel* trusted, and helped further reinforce for members the collective ownership of the space. This does not even begin to cover the expensive computers, tools, and parts in the space that could potentially be taken, and that could be used freely and without supervision except when safety was a concern.

These covert-implicit acts of care were often employed to reassert and establish the hacker identity claims of other members, even when it might have required downplaying one's own identity claims as a skilled hacker. By actively listening to other members when they shared their interests, and by cultivating an atmosphere where nobody had to feel less intelligent for not knowing a particular fact or for not understanding something, members lowered the bar to the hacker identity and encouraged others to adopt it.

The Negotiated Hacker Ethic

What I hope to have demonstrated in discussing the care I observed at Null Alpha in the previous section is not just that members care about each other and Null Alpha as an institution, but rather that caring acts show a deeper relationship between their specific hacker community, cultures of making more generally, the broader community in which they are situated, and their ability to identify as participants in these contexts. Even though there were clear signs of the espoused libertarian influence, members did not, and could not, enact that espoused ideology completely or solely; the actual enacted philosophy relied much more heavily on the interdependence of members, on social connections, and on caring about and for each other than

their explicitly embraced ideology would seem to allow. Community members depended on each

other for support, both in their projects and emotionally as fellow human beings. Their

relationships with each context rely heavily on the interdependence and caring relationships

developed among participants, which appears paradoxical for a community whose espoused ideal

participant is one who is self-sufficient and independent.

In their article on MIT-Fablab Norway, Kohtala and Bosqué discuss the individuality of a

particular space in the FabLab network, and explain, "it is the people and their individual strengths

and curiosities that have formed the Fab Lab movement and will continue its trajectory" (2014). I

would take this insight a step further and add that member's abilities to *care* for one another is also

a crucial aspect of the continued success of these communities. Many of their actions are not

covered in the hackerspace design patterns, are ignored in Gershenfeld's *Fab*, and are often also

neglected in the current literature surrounding maker culture and hackerspaces more specifically.

Obviously, care is common in any community of practice. However, what makes the study of care

in maker communities particularly interesting is how the tension between the espoused libertarian

hacker ideology and the need for community maintenance and interdependent care plays out on

an everyday basis. A few examples serve to highlight the roles that this tension plays.

Earlier, I referenced the failed digital badge implementation to reward members for doing

chores around Null Alpha, such as cleaning the bathroom, tidying up, and taking out the trash. This

project seemed like a good idea at the time: by providing extrinsic motivation in the form of

hacker-made badges signifying the social capital that one has accrued as a result of doing chores,

the plan seemed to capture the libertarian hacker ethos, with its notions of making (a self-made

currency, no less), individualism, competition, and the entrepreneurial spirit of accruing capital. Yet

the experiment failed. Hackerspace members did indeed do chores around the space, but none of

them seemed interested in collecting the badges. Care ethicists note that care is built into our

bodies, our natures, and our social mores. Perhaps the desire to keep the space clean for oneself

and everyone else was, in the collective consciousness of the hackerspace, sufficiently deep and automatic that it did not need the extrinsic motivation of a gamified system to set it into motion.

If the failed badge experiment suggested an instance of care winning out over libertarian ideals, evidence of the opposite also presented itself. The ethos of empowerment so central to the rhetoric of hacking exemplifies this, whether in hackerspaces themselves, mainstream journalism, or academic research papers. In Null Alpha, this was expressed in the ubiquitous refrain "anyone can be a maker." This ethos was, in turn, backed up by a number of tactics to support it. These included the willingness to help others, the nearly infinite patience in the face of "stupid" questions, and leaders' habits of playing down their own expertise to build up the confidence of less experienced members. In many ways, these were all tactics of care.

Yet for several reasons these tactics could also be read as a libertarian ethos appropriating the language or intentions of care. One reason for this might be because these acts of care were instrumentally understood to contribute to the health of Null Alpha, an institution—and egalitarian co-op legally incorporated as a non-profit—that its (non-)leaders were eager to build. In other words, these care tactics were good for business: they encouraged prospective visitors to visit; one-time visitors to become regular visitors; and regular visitors to become dues-paying members.

This kind of tension was also clearly visible when members would discuss issues of diversity and equality within the space. When asked about the poor representation of women in Null Alpha, leaders Jennifer and Nolan typically responded with something along the lines of, "our door is always open to anyone who wants to come." When the topic was discussed in a members' meeting, the consensus was, "all we can do is make sure everyone feels equally welcome here; if you hear of anyone feeling unwelcomed, please bring it up so we can address it." In this hackerspace, making sure everyone felt welcomed meant treating everyone the same. This was demonstrative of a libertarian stance toward equality, which involves assuming a universalized position toward such social and systemic issues, concomitant with an espoused blindness toward

gender, race, sexuality, and other differences. This approach is fairly common within hackerspace culture, and I will present a similar discussion that took place on the hackerspaces.org "Discuss" listserv in the next chapter.

More deeply, the ethos that "anyone can be a maker" obscures the fact that *not* everyone can be a maker. A single mother with three part-time jobs and no car probably cannot be a maker—not, at least, in the sense that "being a maker" is specifically understood in this and other hackerspaces. Such an individual becomes literally invisible in the maker ethos, thus redefining "everybody" down to a certain social class; it is presumably not a coincidence that the majority of dues-paying members were men in their thirties with professional careers, many of which in IT. Likewise, the well-intentioned blindness to gender, race, social class and so forth had no traction to take on *structural* problems that affected Null Alpha, such as gender inequality. It is easy to see in this data that the hackers clearly hoped that they could *individually* woo women and other non-traditional participants who self-selected their way into Null Alpha—which was certainly a laudable intention. But for every such participant who did wind up in the space, how many others did not show up at all? The open-door policy and special attention to special visitors tactic could not reach those (non-)prospective participants. In these instances, the motivation for engaging in what might otherwise seem like care practices could be seen to be subordinated to and in service of the more traditional neoliberal values of the hackerspace.

On a smaller scale, focusing only on interpersonal interactions, the tension between the care ethos and the libertarian were expressed in subtle ways. Most of the overt or direct care that took place in this space took the shape of working on projects together or using each other's tools, while the more implicit forms of care tended to be the care that supported identity formation and feelings of inclusion. One reason these were implicit was because if they were explicit, the participants would have had to engage directly with how these moments of support conflicted with the espoused hacker ethic and ideals of self-sufficiency and independence. This points to a tension

in the participants' identities as hackerspace members: one where they had to choose between being "real" hackers or being supportive community participants. Many of the members found ways to negotiate this tension: Greg often acted as though he was not excited about a project, acting instead through a veil of detachment, even though he was often the quickest to provide support; similarly, Jennifer used sarcasm and irony to ease the tension of situations or to help outsiders feel included and familiar; and several members, notably Nolan and David, relied on constructing instructional scenarios that demonstrated care in a maker-sanctioned modes of expression. Members might not have felt like they had the space to explicitly address each others' subjective states, and were instead more comfortable enacting care through these more covert means. I, on the other hand, tended to break these norms, often relying on my role as the researcher in this space to be more explicit in the ways that I cared for my participants.

Caring for My Participants

In my role as a somewhat documentarian of what hackerspaces are like, I was often placed in a position of validating these members' identities as hackers, or reassuring them that their thoughts or behaviors were perfectly normal within the context of their community, and I tended to use meaning imparting strategies not typical in the hackerspace to do so[7]. When John expressed his concern that he had not made anything or worked on any projects during his previous visits—a concern that eventually grew until he stopped attending Null Alpha—I was placed in a position where I had to respond reassuringly, explaining that Null Alpha is often more of a social club, and that not building or working on a project is, in fact, perfectly reasonable and typical behavior of many of the hackers in this space. Similarly, when Drake confessed, "*I haven't really impressed myself in a really long time. From now on, I only want to work on projects that nobody else has done before, or that will take me less than a day to complete*," I felt that I had to reassure him and validate both his behavior as well as his frustrations with his behavior. In an interview with Justin,

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[7] Some of the text in this sub-section draws from a journal publication (Toombs, Gross, Bardzell, & Bardzell, accepted).

the stay-at-home dad who joined the space near the end of my ethnography, I had to convince him

that he was just as much of a member as anyone else, and therefore was just as capable of running

the tours when impromptu visitors needed one:

> **Me:** *Yeah, and have you ever given any of these tours?*
> **Justin:** *No. I uh I would not feel comfortable being the tour giver at this point.*
> **Me:** *Oh, why not?*
> **Justin:** *Well I could-I could do a decent job of pointing a few things out, um, but like I said, I like to defer to the people that have been here longer and that are, um, have a stronger foundation in a lot of the skills that are being utilized at [Null Alpha].*
> **Me:** *Okay, you—you're totally qualified to give the tours, by the way.*
> **Justin:** *I'm getting there. (both laugh) I have a few details down.*
> **Me:** *I think-I think you're fine. I think you overestimate how detailed the tours actually are.*

This validation component of the ethnography also seemed to extend to inclusion in the

study. Several participants expressed a desire to be interviewed, possibly viewing such an invitation

as a recognition of their hacker skills. While I was coordinating schedules for an interview with

Jennifer, Calvin asked me directly, "*So, am I going to get to be interviewed at some point?*," and

Nolan, possibly in defense of Calvin's skills, chimed in with, "[Calvin]*'s done some pretty cool

projects too.*" In that moment, I told him that I would, of course, be getting around to interviewing

him, but it was several months before I approached him to schedule the interview. In my field notes

for February 12, 2014 when I asked him if he'd like to be interviewed for a class I was in, I wrote

"Steve agreed to be interviewed…and was excited, saying 'I haven't been interviewed yet.' It

sounded like he felt left out." In related instances, members would direct my attention to events

they wanted to show off to me, including things they thought I might enjoy, or things that they

thought might help them look more like hackers, like when Greg would say, often, "*I'm about to

do a new weird hacker-y thing if you care to watch.*" When I visit the space now after no longer

being a regular member, my ex-participants are quick to show me what has changed in the space

and what they have been working on since the last time they saw me.

What I found to be closely related to this desire to have their experiences validated was the

focus that occasionally surrounded my note-taking. Commenting on note-taking was often used as

an entry point to a conversation about the research goals. Participants were curious about the kind of information I was recording, and frequently commented on the high volume of notes. In some cases this was intended as a compliment, and I was once offered a paying gig to document one participant's project (which I, of course, declined). In other cases, participants wanted to make sure that they were performing well as hackers, or that they were interesting enough to make it into my notebook. They also wanted to make sure they were being recorded favorably, and were often disappointed to find out that my research notes were intentionally low-inference. I generally allowed participants to read over my shoulder if they were interested, and I would readily walk through why I recorded what I did.

On particularly slow days in the space, participants would prank me by whispering nonsense into the audio recorder, by grabbing my notebook and pretending to read fake narratives aloud to other participants, or by writing their own messages in it. In one instance, after Drake had been dismissive of one of my ideas during a discussion about the physics of building a replica of a video game robot, Drake joked that I was writing "*today, Drake asserts his dominance by being a jerk*." In this act, Drake's joke served as an implicit apology for his behavior, but also as a way to be reassured that his actions were not being misinterpreted. In these interactions, discussions about the research project served to highlight the stake that participants had in its outcomes, which seemed to center on identity validation and on making sure that my account of what was happening in the space matched theirs. As a researcher of the space, they assumed I had a form of authority to explain what was taking place in the space, and who was or was not really a "hacker." When checking with me about what I was recording, they wanted to make sure that I also thought they were hackers. In one instance right at the start of an observation, many of the members were sitting around the meeting table and having a casual conversation about cartoons. When George noticed that I was taking notes, he exclaimed, "You're taking notes?!" in a tone of voice that could have been interpreted in several ways, the most likely of which being that George either thought

this particular conversation was too uninteresting for me to waste my time on, or that he was embarrassed that I might be characterizing this particular conversation as something that typically happened in the space, even though it was not very hacker-like.

In engaging with my participants, I tended to adopt atypical methods of validating their place within their community. I did this not because it is a part of my personality to do so or to break the norms of a space in order to provide care for someone through some motherly instinct, but rather because my position as the person researching the space seemed to require those behaviors of me. Hackers looked to me to tell them if they were doing a good job at being hackers precisely because I had the imagined authority to do so. I engage with the resulting messiness of this interdependence between researcher and participant in the concluding chapter.

Conclusion

Ultimately this hackerspace relied heavily on care and on community involvement and engagement. Extending more broadly, current literature on making cultures often discusses how the barrier of entry to these communities and practices can be lowered. It is easy to conceive of this barrier as comprising knowledge or skill requirements, or difficulty *understanding* or figuring out how to physically get started. It is more difficult, but perhaps more accurate, to conceive of these barriers as sociological; who is or is not able to participate in these activities might have less to do with their skills and more to do with their ability to fit in with these communities of interest. An analysis of the care and care ethics involved in these communities can help uncover how they actually operate on the ground.

As making and hacking become grounding practices around which communities form, their underlying norms and ethics have to adapt to accommodate the inherent everyday sociality of what it means to become part of a community. This adoption can lead to tensions between the old and new ethics. Critically engaging with care theory and care ethics has helped point to where those types of tensions are productive and where they break down. In the case of this hackerspace,

investigating the care enacted in these social situations revealed certain vulnerabilities that accompany the adoption of a hacker identity, such as the tension between being a "real" hacker and being a good community member, or the confusion associated with acknowledging or rewarding explicit acts of care.

In the next chapter, I extend my analysis to a broader consideration of hacker culture, analyzing the discussions that take place on a global listserv that is explicitly about discussing and advising others through typical problems faced by hackerspaces.

CHAPTER 6: HACKER IDENTITIES AND COMMUNITIES ON A LARGER SCALE

In Chapter 4 I investigated the link that seems to exist between a hacker and her craft, her ability to work with tools, and the projects she creates by analyzing the projects of several individual hackers. In Chapter 5 I introduced the notion that interdependence between hackers is another important aspect of developing a hacker identity, and I discussed various ways those hacker identities are nurtured in a specific community. In this chapter, I take a further step back to explore how that interdependence is legitimated or formalized (or not) on a larger scale by analyzing the discussions that take place through the global—though still mostly US-centric—hackerspaces.org "Discuss" listserv.

In the following sections, I document and discuss the issues brought up by hackerspace members in the United States and elsewhere, using public messages sent to a popular community listserv from 2008 to 2015. I identified thirteen of the longest and most active threads, totaling 851 messages, and used the constant comparative method to identify themes concerned with community maintenance practices, values, norms, ideologies, identity adoption, or social policies. This analysis contributes to the collective understanding of communities of making and hacking by broadening the current focus on individual makers or individual communities to the hacker movement as it is participated in and discussed, argued about, and defined by hackers on a larger scale. I am particularly interested in the *social* and *community* politics of hackers discussed in this way, and what limits or patterns of social interactions and interpersonal relationships are imposed through policies (or lack of policies) across communities of hackers. What I found was that hackers attempt to control the definitions and identities that can be associated with "hacking," that they use rhetoric that appears to be in support of the diversification of hackerspaces in order to control conversations about what values are supported, and that they continue to support overall exclusive environments by resisting the implementation of formalized social or behavioral policies.

The Hackerspaces.org Discuss Listserv

The data for the analysis in this chapter are drawn from the publicly accessible "Discuss" mailing list hosted by hackerspaces.org described by the site thusly: "If you want to actively discuss hackerspaces the Discussion List (unmoderated) is where you want to be"[8]. This listserv is used by a wide range of people, including hackerspace administrators, members, regular visitors, and individuals interested in joining or starting their own hackerspaces. Discussions that take place on this listserv often reach even more people than are subscribed to it, as they are forwarded (selectively) to the listservs associated with individual hackerspaces. The discussions range from in-depth cultural debates about what is or is not appropriate hacker activity or behavior, to tools for keeping up with the everyday maintenance of the groups' physical environments. As a result, this listserv is one of the primary avenues through which hackers, on an international level, discuss what it means to be a hacker and manage the community values and identities they share, however loosely.

Using a custom-built web scraper, I downloaded the message body, subject, date, and author of every email sent through this listserv between its conception in July 2008 through the end of June 2015. In addition to the "Discuss" list, I had also originally downloaded the "Equality," "Theory," and "Event Theory" lists, but they are not included in this reporting in favor of a more tightly scoped analysis of the Discuss list, which has a much larger participating audience and an even wider reach. This data set includes 885 distinct author names, 10,606 total messages, separated into 1,896 individual message threads with an average of 5.59 messages per thread (SD=8.62). In calculating the total number of threads, I applied significant effort to finding and rejoining threads whose subjects had been somewhat altered by human error. I also worked to clean the author names that were similar but had changed over time as they switched primary email clients, or left and rejoined the list at a later date. Being generous with my associations

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[8] https://wiki.hackerspaces.org/Communication

between gender and author names, only 6% of the emails in these top 13 threads were from women.

I analyzed a subset of thirteen of these threads using the constant comparative method (Glaser & Strauss, 1967) to highlight themes of importance to the global hackerspace community, as well as how they discuss the kinds of interpersonal relationships they believe should (or should not) take place. I determined which threads were in this top thirteen by combining the ten threads with the highest number of individual messages in them with the ten threads participated in by the highest number of distinct individuals. These two top-ten lists overlapped significantly, resulting in 13 distinct threads. These thirteen threads, which will be covered in more detail below, all originated from the discuss listserv, include 199 distinct authors, and 851 total emails with an average of 26.92 authors per thread (SD=5.24), and an average 65.46 messages per thread (SD=15.79). I coded these 851 messages of the 13 threads through two rounds of coding. In the first round I open-coded the messages to generate a list of discussion topics and themes, as well as characterizations of how participants on this list interacted with each other and how they described their interpersonal interactions in their individual hackerspaces. I then reorganized the resulting codes and grouped them into larger themes that were more directly relevant to the interactions, relationships, and interdependence between hackers and the impact that has on their practice and participation. This focus on interdependence and identity development is informed by the care ethics lens explored in the previous chapter.

I used this axial coding to inform the second round of selective coding, which categorized each of the 851 messages in a more structured way. After coding the second round, I visualized the codes in Tableau to get a sense for what the predominant attitudes were throughout each thread. In the next section, I give an overview of each thread and how the conversation developed over time, informed by the prominent codes and tropes that characterized the conversations in those threads. Since the purpose of this analysis was not to definitively characterize these threads in a

discourse analysis way, I will not be reporting on the stats of the codes used (e.g., how many times each code was used, etc.). Rather, the codes were used to help characterize the threads and trace the topics commonly brought up within them, as well as to help characterize the kinds of relationships that were sanctioned (and which were not) through these discussions.

The Top Thirteen Threads

In this section I summarize each of the top thirteen threads as they unfolded on the listserv. As I describe the threads, I will trace the recurring tropes—words and short phrases that are often used for symbolic affect and to refer to shared conventions—that appeared in them, as well as how those tropes were used to direct or control the conversation. In the following section, those tropes and prominent themes are unpacked to discuss the underlying ideologies that pervade this online community and, through it, hackerspace culture at large. Table 1 lists the subject of each thread, the date of the message that originated it, the total number of messages linked to that thread, and the number of distinct authors who participated in it. Names of participants have been changed to protect their identities. Table 2 lists the most used tropes that I mention throughout the following summaries, as well as the number of times that I coded those tropes in the 851 emails, and a sample quote for that particular trope. It is important to note that the number of times the trope was coded refers only to when these tropes were explicitly called out in a way where they could be coded. This does not include, for example, the number of times these tropes were tacitly referenced in conversation, which would take a larger analysis outside of the scope of this dissertation to address.

#	Subject	First Message	Messag	Aut
1	Status of this list	May 14, 2009	74	24
2	Children in hackerspaces	Jan. 24, 2010	49	27
3	Sticker exchange	Feb 10, 2011	57	26
4	Out with the "hackers"…In with the "makers" and the "fixers"	Nov. 27, 2011	75	38
5	HACKING IS NOT A CRIME vinyl stickers	Nov. 29, 2011	64	31
6	Will the fruits of our labors be used for good or for	Nov. 30, 2011	58	21

7	Another registry?	Feb. 8, 2012	46	28
8	New member vetting	Sept. 18, 2012	45	30
9	Firearms in hackerspaces?	Jan. 14, 2013	79	25
10	Safe Space Policies?	Jan. 26, 2014	101	27
11	Let's end the unnecessary joining of the words "food" and "hacking"	Jan. 27, 2014	68	31
12	In defense of Noisebridge (even if I was never	July 3, 2014	53	15
13	Leadership abusing powers. Bullying. Extraordinary General Meetings.	Feb. 20, 2015	82	27

Table 1. Top 13 Threads' subjects, date of first message, number of messages, and number of

distinct authors.

Trope (#of times coded)	Sample Quote
"Hacking is a-political" (106)	"We did not build a hackerspace to make a statement, we built a hackerspace to share its potential and to do and try things you cannot do or try elsewhere. This is why I consider it very important not to let politics interfere with the great amount of possibilities and chances and cool ideas we develop and share at our hackerspace." (PID10221)
"Every space is different" (32)	"The diversity between Hackerspaces is one of the strengths of the movement, I think. Everyone can find a space that is aligned with their personal interests and goals." (PID4899)
"Everyone is welcome" (28)	"We are having a open tuesday soon and people (and i admit, me too) dont understand what it is about , its abstract. We just say our doors are open everyone is welcome. But what sort of activities do you usually do on open tuesdays? Like a meeting where people. introduce themselves and say what they hack? Id love some examples" (PID1902)
"Hackers are critical thinkers" (25)	"hackerspaces are a meeting grounds for new ideas. I hope that regardless of our values individually or as communities we are always open to the ideas we do not agree with and are willing to accept them as the tremendous resource that they are, rather than a threat to ourselves and the things we value." (AID558)
"Fitting in with the community" (25)	"You don't create culture with a checklist. Culture is created by the people who are already there. If you like your culture, keep the people who are there and welcome people who want to be a part of that culture. If you don't like your culture then maybe you should find another pool to swim in." (PID1822)

"Just ignore things you do not like" (23)	"Why couldn't they just ignore threads that they didn't like?" (PID252)
"Fear of censorship and abuse of power" (16)	"The risk with a moderator is that s/he abuse her/his powers. There is a big group of people here who doen't have this problem because they have a candidate that they trust for not abusing this. I am not sure you can generalize to all Americans on the list :)" (PID10200)
"'Be excellent to each other' should be enough" (13)	"Can we all just go back to being excellent to one another?" (PID1812)
"Less talk, more action" (10)	"Dear lovely internet, debating on the definitions and acceptance of the terms hackers and makers is not either hacking nor making. Every minute put into discussing the terms is a minute lost from actually hacking any of the context or making something more meaningful and globally accepted of these words." (PID5656)
"Noisebridge is a bad example" (7)	"Is this list becoming the new noisebridge-discuss? This has all been very droll and everything, but I think it's time for a moderator to step in." (PID303)

Table 2. The most used tropes, a sample quote for each, and the number of times I coded this trope in these 13 threads.

1. "Status of this list"

The first major discussion (**1**) centered on the arguments for and against incorporating a moderator on this relatively new listserv, and set the tone for what was to come. This argument began in response to several other threads in which list participants demonstrated poor behavior when they disagreed with another's standpoint. Unsurprisingly, the majority opinion was that no moderators were necessary yet, because that would introduce the risk of censorship—a red flag in this community—and that those who were offended by certain messages should learn to manage their email clients better and simply mute conversations they find distasteful. This call to "just ignore things you do not like" would become a prominent theme in every subsequent major discussion, as did the argument that "be excellent to each other" should be enough of a social guideline for hacker communities. Dissenting voices argued that it is not possible to un-read racist, sexist, homophobic, or similarly offensive remarks, and that for all the fear of censorship displayed

by participants, they seem to forget that by supporting hostile environments they are implicitly censoring certain voices by not making room for them to participate in the first place. Nonetheless, "just ignore them" and a nod toward better self-moderation was overwhelmingly favored over creating a set of explicit rules of behavior for the list. This particular argument was responsible for the creation of the Theory listserv, as others lamented the "spam" that discussing behavioral norms was generating.

2. "Children in hackerspaces"

Discussing "children in hackerspaces" (**2**) primarily revolved around the tension between following the letter of the law laid down in a space's insurance policy (which typically view children as a liability), or taking a pragmatic approach and assuming that if any child did get hurt in a space, then their parents would surely be reasonable enough to assume responsibility. Interestingly, both arguments demonstrated a certain level of care, but targeted different levels of "community": arguments against accepting the liability risk showed concern for the local community, whereas arguing for including children showed concern for the *global* health of hackerspaces as a "movement," arguing that children played a vital role in carrying on the culture of hacking. Ultimately the conversation died down when the "every space is different" trope was invoked, which is commonly applied to control the direction of the conversation by subtly reminding others that since there is no central hackerspace authority, any attempt to convince other spaces to adhere to a normative standard are futile. As a result of this conversation being shut down, the original question posed to the listserv about whether it would be worth it to choose an insurance policy that covers minors or not was never directly addressed.

3. "Sticker exchange"

The sticker exchange thread (**3**) represented a global community bonding effort in which members of multiple hackerspaces could send in 50-100 of their hackerspace's stickers—if they did not have one yet they designed one based on their community's logo—and would receive in return

a collection of all of the stickers sent in. Unlike many threads that made it into the top 13 most participated in threads based on the contentiousness of the topic, this thread passed the mark by presenting an opportunity in which many spaces wished to participate; the majority of messages in this thread revolved around coordinating participants and submitting addresses. Though it took several attempts to include all of the spaces that wished to participate, the thread was largely uncontroversial and not much of a discussion.

4. "Out with the 'hackers'...In with the 'makers' and the 'fixers'"

"Out with the 'hackers'...In with the 'makers' and the 'fixers'" (**4**) began as an attempt on the part of one person to convince participants in the list to use "maker" or "fixer" and to stop using "hacker" to describe themselves and their communities. Naturally, this was a contentious topic, revealing how dear and nostalgic the term "hacker" is to many who claim it as part of their identity. Arguments against the word "hacker" drew primarily on the negative connotations of the word as it is portrayed in various media venues, with claims that this results in scaring people away or, at the very least, not providing a welcoming enough environment to people who could benefit from such spaces. Another prominent trope, "hackers are critical thinkers," was used to guide the conversation, pointing out that media interpretations of the word should not affect how hackers actually use it, and heavily implying that hackers *should* be able to escape the tone of the word set by the media because hackers are smarter than, or better than, the media. When that failed to kill the argument, "every space is different" was applied to remind participants that they could not control how others defined their spaces. Perhaps due to its contentious nature, this thread spawned several other threads, two of which (5 and 6) were also large enough to make it into the top 13 threads.

5. 'HACKING IS NOT A CRIME vinyl stickers"

After enough people expressed their frustrations with semantic arguments in thread 4, the "less talk more action" trope inspired one participant to create stickers that said "HACKING IS NOT

A CRIME" to solve the media interpretation problem being discussed. He started a new thread (**5**) to coordinate sharing addresses for spaces that wanted to participate. In some cases, participants who were behaving antagonistically in thread 4 behaved pleasantly on this thread, perhaps in an attempt to demonstrate that they were not altogether unreasonable people. The individual creating the stickers mentioned several times that people could pay whatever they could afford, and that anything extra would go to his "dying" hackerspace. Others used this as both an opportunity to participate in a global bonding experience, as with thread 3, as well as to show concern for a hackerspace that needed assistance, offering encouraging words and expressing concern for the dying hackerspace.

6. "Will the fruits of our labors be used for good or for evil?"

In the middle of the debate in thread 4, one participant attempted to demonstrate that "hacker" could have positive connotations as well by explaining how the government was currently attempting to reach out to these communities, citing indications that DARPA (Defense Advanced Research Projects Agency) would soon be funding hacker-related projects as evidence. This heated discussion very quickly turned into an ethically-charged debate about whether or not it was appropriate to accept money from DARPA—or any government entity—for the purpose of hacking, primarily because it was impossible to know ahead of time if the resulting innovations would be misused in a way that would end in lost lives. As this was now a full-blown tangent from the original makerspace vs hackerspace discussion, it was continued in another thread (**6**). A common theme in this discussion was that aligning a hackerspace with DARPA would improve DARPA's general image, which hackers should consider a Bad Thing: "They want to co-opt a ground up, grassroots movement, hackerspaces, for their own ends. Why should we help them?" (PID5438[9]). Any attempt to discuss side effects of improving DARPA's image were shot down with the "hackers

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[9] Quotes from the listserv are referenced by the Post ID assigned in the analysis process.

are critical thinkers" trope, reminding participants that anything related to the military industrial complex must certainly be evil and could be nothing else.

7. "Another registry?"

Just a few months after the first maker versus hacker debate, the argument surfaced again (**7**) after one participant shared his confusion about whether he should register his hackerspace—which he also referred to as a makerspace interchangeably—on hackerspaces.org or makerspaces.com, a newly formed site at the time. Participants were quick to point out that makerspaces.com was yet another Bad Thing as it was an attempt on the part of Make magazine to commodify the hacker ethos. Very similar arguments were presented as in thread 4, which involved several attempts at identity policing—controlling what definitions others used when defining their hacker or maker identities—as well as resurfacing the discussion about children as liabilities or as simply "in the way" in hackerspaces. The "every space is different" trope was eventually used to justify any permutation of referring to one's community as a hackerspace, a makerspace, or interchangeably depending on the context. The moderate stance some participants explained seemed most common, which involved introducing the space first as a "makerspace" because that word is more inviting and welcoming, and then later explaining to the visitor or newcomer once they had a chance to see the community first hand that "hackerspace" is not such a bad word.

8. "New member vetting"

A deeper discussion of the new member onboarding process in (**8**) demonstrated a tension between blindly trusting new members and protecting current members. Several strategies for vetting new members were proposed, ranging from incredibly bureaucratic—some even requiring background checks—all the way to "anyone can give us 5 dollars online and have 24-hour access to the space." The prominent pattern discussed leaned toward trusting new members after they were "known" to the current members of the community, sometimes including a distinction

between regular members and key-holding members and setting up a divide between who should be allowed to be in the space by themselves and who should not. The only concerns raised against such loose membership policies were tied to what the space's equipment infrastructure looked like: were the tools owned by the space or by individual members? If owned by individual members, spaces tended to err on the side of caution for the safety of the members' equipment. Whatever way the member-vetting strategy took shape, what seemed to be uncritically accepted by all was the notion that any single dissenting vote to a person's membership would prevent that person from becoming a member. Those who were already a part of the community always took precedent over any outsider in a form of systematic cronyism, emphasizing that "fitting in with the community," another trope, was more important than the community making room for diverse members.

9. "Firearms in hackerspaces?"

"Firearms in hackerspaces?" (**9**) was, unsurprisingly, a politically charged policy discussion where various spaces shared their firearm policies (or lack thereof). Many of the comments in this argument were shared in an identity-policing manner, where participants expressed that whatever stance they were communicating was the stance that best-aligned with what it means to be a hacker (e.g., "You can't be a hacker if you are in favor of limiting my rights"). Thus, the debate also served as a showcase of sorts for the varied political stances possible, from complete apathy on one end (often rationalized by the fact that there are plenty of other, more dangerous things in hackerspaces to be worried about), a complete ban of firearms on the opposite end, and itemized restrictions about ammunition somewhere in the middle. Gun ownership as a constitutional right did factor in, but was quickly dismissed as one participant reminded others not only that hackerspaces are not always public property and therefore whatever policies they have in place must be respected even if they conflict with personal identity politics, but also because "every space is different."

10. "Safe Space Policies?"

Perhaps the most contentious of all thirteen threads was the discussion surrounding the various safe space policies, if any, in place in hackerspaces (**10**). The thread began with one person's question about how others had implemented their safe space policies. The assumption was that this person was going to be implementing their own in their space, and they were looking for feedback about how that worked (or did not work) in other places. Many participants in this thread were unable to understand the systemic issues with their stances against implementing a formalized policy, repeatedly invoking the "everyone is welcome" and "'be excellent to each other' should be enough" tropes as arguments against formalizing an anti-harassment stance. A common sentiment argued that formalizing anti-harassment rules would pose a problem to the existing hacker community because hackers would not (or, perhaps, *should* not) feel warmly about *any* rules, no matter what they were about. Some confused the need for such formalized rules as signaling a deep problem in the community, and worried that this signal would be misinterpreted by outsiders who would then think that the group was somehow rotten if they needed such policies. Anti-formalized policy arguments also revealed a fear that individuals would "pretend" to feel harassed or unsafe as a way to silence other participants (playing on the "anti-censorship" and "fear of abuse of power" tropes). More moderate voices argued, instead, that modeling appropriate behavior for the community was a much better stance, as it would skirt the issue of explicitly discussing anti-harassment or safe space policies, while ensuring that the community could behave positively. Arguments in favor of formal policy pointed out that having a more explicit policy would signal to minority populations that their concerns would be taken seriously. To make this point, proponents called out those in opposition on their privileges within their spaces (e.g., being white, heterosexual, and male in a group where those characteristics make up the overwhelming majority). This tactic was made difficult by the fact that many proponents enjoyed the same privileges, for which they were accused of hypocrisy. Throughout all of these arguments

there was a clear sense of concern for the health of the individual hackerspaces in question, but no consensus could be reached about how best to serve the community.

11. "Let's end the unnecessary joining of the words 'food' and 'hacking'"

As the subject suggests, "Let's end the unnecessary joining of the words 'food' and 'hacking'" (**11**) was a pedantic thread in which one participant attempted to persuade others that "food hacking" was not, in fact, a form of hacking. He was antagonistic about this right up until others started calling him out on his aggressive behavior, at which point he shifted to a victimized tone. Even when others provided adequate examples and alternative definitions, he denied their applicability. Eventually this thread ended as participants muted the conversation out of annoyance, usually while pointing out: "Those who try to define hacking and hackers are doomed to an eternity of defending their interpretation" (PID1659). Very few supporters for this position emerged; instead, many voiced their support of an inclusive definition of hacking that was not limited to specific technologies or methods but to the intentions or motivations behind an activity, centering on the "hackers are critical thinkers" trope. These included: "hacking is achieving command or creative use in a domain in such a way that one sparks the ability to progress beyond what was laid out by those before them. You really can do this with anything, at any place and with any sort of people. And that's why a lot of hackerspaces encourage talents and ideas of all colours" (PID1670) and "the definition of hacking that I always share with people in my talks is the one given by the hacker Jude Milhon who was hacking from the late 1960s until her death in 2003: 'Hacking is the clever circumvention of imposed limits, whether imposed by your government, your IP server, your own personality, or the laws of physics'" (PID1710). Most participants appeared to be in support of these more inclusive definitions of what it means to hack. However, it is important to note that the person who started this thread is well known for the illegal hacking practices he participated in and was arrested for in the 1990s, and his personal

reputation with the hacking community is not favorable, so it is likely that some participants disagreed with him in this thread as a matter of principle.

12. "In defense of Noisebridge (even if I was never there!)"

Noisebridge, a well-known hackerspace in the Mission District in San Francisco, is often discussed as somewhat of an anomaly among the wider hackerspace community. Even Noisebridge members have been noted as saying, "No hacker space is required to operate like Noisebridge, nor in fact should they ever" (PID4144) after describing Noisebridge's radically liberal policies. Noisebridge-bashing is a common occurrence on the listserv, where participants recount their experiences with the chaotic, confusing, hostile, or dramatic environments they have encountered there. After one such bashing thread, a participant who thinks highly of Noisebridge defended its militantly open-door policy, but also acknowledged that their model might be better-suited for European hackerspaces, rather than USA hackerspaces (**12**). This quickly turned into yet another definition policing debate about the distinction between hackerspaces and makerspaces, after another participant extrapolated the craziness encountered at Noisebridge to all communities that favor the term "hackerspace." After the initial semantic arguments died down, the thread turned to a debate about what level of political activism is appropriate for hackerspaces to engage in, focusing on "civic hacking" as a specifically problematic phrase. According to many who prefer to think of themselves as apolitical, the primary purpose of a hackerspace is to make and create things, and activist outcomes are merely byproducts of those activities and, because of this, personal politics should be left at the door when entering a space. The "hackers are critical thinkers" trope was used to rebut this notion, drawing on a collective sense of nostalgia to remind other participants of the history of hackerspaces as intentionally activist and political. This notion then circled back to the distinction between makerspaces and hackerspaces, with hackerspaces being political and, therefore, also critical thinkers, and makerspaces being simply about creating.

13. *"Leadership abusing powers. Bullying. Extraordinary General Meetings."*

The final thread in this corpus, "Leadership abusing powers. Bullying. Extraordinary General Meetings" (**13**) began when someone who had recently been kicked out of a hackerspace reached out to the broader hackerspace community through the listserv in order to make sense of what had happened to him. He suggested that the leadership at his space simply did not like him, and after a lot of bullying they managed to find an excuse to kick him out. Other participants attempted to empathize, offering sentiments that suggested that the leadership of that space just wasn't "excellent" enough, so he should start his own space with his own rules. Empathizers relied on the "fitting in with the community" trope, explaining that if there was a disconnect there, then it was best for everyone involved for there to be distance rather than forcing the connection. As the thread progressed and he shared more information about the events that led to him being kicked out, it became more apparent that he had not been victimized but had, instead, been kicked out for lacking the social skills required to interact harmoniously with the group. Other participants attempted to break this revelation to him gently at first, working through in-depth explanations about how the behaviors he cited as harmless—e.g., referring to people using the pronoun "it" intentionally even after being asked not to do so, being willing to "die on every hill" in arguments that others had no real stake in, and claiming that others who did not like his behavior should just ignore him and move on—were, in fact, problematic behaviors if one expects to participate in a larger group, especially with a group of "critical thinkers." He resisted every explanation, eventually killing his own thread as a critical mass of participants muted the conversation, but not before they pointed out the irony that his behavior on-list demonstrated exactly why he was kicked out of his hackerspace in the first place. The almost-counseling behaviors exhibited in this thread were quite unique in this corpus, and it was easy to see the tension between spending the time to demonstrate for the individual why his behavior was inappropriate versus simply ignoring him and

moving on. Many would-be counsellors began their emails with sentiments like "I'm not sure if this will help, but…" and "This is probably falling on deaf ears, but…".

The prominent tropes guiding these conversations— "every space is different," "everyone is welcome," "hackers are critical thinkers," "'be excellent to each other' should be enough," "just ignore what you don't like," "less talk more action," "hacking is a-political," "less talk, more action," and "fitting in with the community"—were often applied in an attempt to present a false dichotomy where there perhaps should have been more room in the middle ground to explore. In the next section, I will unpack several of these tropes and the ways they were used to promote a particular set of ideals within the broader community that participates in this listserv.

<div align="center">

Controlling Hacker Culture

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Although each hackerspace is a unique community in its own right, there are common themes, rhetorical strategies, and ideologies visible throughout the discussions on this listserv. I analyze these here not as an attempt to better-understand the communication practices that take place in this listserv—though that would be a valuable study in its own right—but rather to bring to light the ideologies and "ideal types" as they relate to both the diversity of hackerspaces and the diversity within hackerspaces that are uncovered by taking note of how various tropes are used, and in what ways they are effective in global conversations about hackerspaces. The three themes in this section—Definition and Identity Policing, The Diversity of Hackerspaces, and Resistance to Formal Policies—are used to unpack the tropes-as-rhetorical-devices used to guide or control discussions on the listserv, revealing the tacit politics and ideologies in which the broader hackerspace society participates.

Definition and Identity Policing

Within the listserv context, definition policing and identity policing serve similar strategies. Attempts to define what hacking is or can be are invariably tied to discussions of who hackers are and who can claim to be a hacker. The most common arguments when it came to who hackers are

or what hacking is all about centered on discussions of counter culture, critical thinking, taking action rather than wasting time in discussions, and, ironically, about being apolitical and anti-activist.

Hacking-as-counter-culture discussions were often referenced in a nostalgic way, wherein one participant would explain some facet of hacker history or how hacking as a practice came about to another. These hacker histories largely agreed with how academics and mainstream authors have characterized the emergence of hacker culture (e.g., Levy, 2010 or Maxigas, 2012), so I will not go into them in detail here, but I will focus instead on how this theme is used in conjunction with the "critical thinking" and do-acracy themes to function in a tacitly exclusionary way. Hacking as counter-culture exists in a constant tension with the often espoused philosophy that everyone is welcome to participate in hacking practices, as these are categorically disjointed characterizations: a practice cannot, by definition, be both counter-culture and participated in by everyone. In several threads, and especially when making the distinction between using the word "hack" rather than "make," references to the counter-culture nature of hacking is used to explicitly exclude anyone who would be considered a non-critical thinker or who would not appreciate the counter-cultural narratives of hacking. A participant who was concerned about the exclusionary affect that the term "hacker" could have explained:

> "By using the term 'hacker' you drive people away without ever getting a chance at recruiting them. All over a word. Is that what you want? You may assert that you don't want these 'mindless dweebs' in your spaces anyway. A very adolescent attitude. You won't get a chance to find out what these people have to offer because they never get a chance to get started with you. All over a word." – PID5658

The arguments surrounding these types of claims were typically based on the premise that, because hackerspaces have such a large potential for educating the public, it would be a shame to turn people away, even accidentally, just for the use of the word. Others countered this with arguments similar to the following:

> "You are describing a wonderful feature IMHO: the name alone acts as a filter to repel people who might be afraid of the more itchy parts of hackerspaces. The kind of people

who would be afraid to be associated with anything mentioning 'hackers' would be the kind of people to refuse that the space takes part in lock picking workshops, building pirateboxes, DIY dildonics or wardriving. Using 'hackerspace' as a name is a good way of saying that this will be hard to use your membership as a career booster, which is fine, because it is really not the goal." – PID5640

Others took this even farther, and linked it more directly with their identities as hackers and

makers:

"The American public doesn't know squat. I utterly refuse to kowtow to ignorance. Allowing the likes of the DRM folks and sundry clueless commentators to steal our identity and roots is just not acceptable. [...] No. Not acceptable. I am a hacker, not a 'fixer' or a 'maker' accept [sic] by description of the results of some of what I do. Being a 'hacker' is a badge of honor and I refuse to act as if it is something dishonorable." – PID5626

The primary tension here is between thinking that hacking is *supposed* to be counter-culture, but

that it should also be something that anyone can participate in. As there is no central authority over

hackerspaces guiding how this should be addressed, this tension cannot be resolved in a

generalized way but must be discussed at each space, individually. There is, then, a lot of pressure

on each space to be able to define what hacking is in a way that helps them seem inclusive (if that

is one of their goals, which we will see in a later section is not always the case), while also feeling

as though they are adequately representing the broader "hacker movement." Based on the

responses in the listserv, it seems that many spaces simply ignore this tension, thereby tacitly

reinforcing the exclusion of those who are turned off by this word without taking action to actively

address such misinterpretations.

Further complicating this tension was the pervasive description of hackerspaces as enacting

a "do-acracy," establishing a false dichotomy between those who actually solve problems and

those who simply talk about them. This appeal to the "do-acracy" social structure that all

hackerspaces theoretically inherit is often invoked to stifle discussions on the listserv in unhelpful

ways that do not lead to the solution of the problems being discussed. This is notable in the

transition from thread 4 and 5. In an argument about what, if anything, should be done about the

contentious nature of describing these spaces as "hackerspaces," the first suggestion of a concrete

action posing as a solution was supported—in this case, creating "HACKING IS NOT A CRIME" stickers—without any discussion around whether or not this action could even solve the problem at hand. The result of this kind of posturing is often that many who participate in these kinds of proposed events feel a sense that they are improving upon the situation because they are "doing" something about it, even if the "solution" could not possibly address the problem. The reason this strategy works so well is because being a part of a do-acracy—with the accompanying belief that doing is better than discussing—is presented as inseparable from adopting an identity as a hacker. In other words, if one does not stop discussing and start creating or immediately heed these calls for "less talk more action," then one cannot *truly* call themselves a hacker. It thus becomes difficult to discuss complex issues—especially issues of diversity or inclusivity—in a deep way, because once someone invokes the "less talk more action" trope, an activity is proposed and must be worked toward, even if the activity is only tangentially related to the problem.

Tropes used in definition and identity policing impacted perceived diversity in several forms, with "hackers as critical thinkers" doing the brunt of the work in a variety of ways, in addition to excluding "non-critical thinkers" in the hackerspace v. makerspace argument. Calling on hackers to act as critical thinkers was occasionally used by someone in opposition of an argument or a proposed idea to remind others that they do not have to abide by this other person's limitations. In discussions where one person attempts to restrict the definition of hacking, for example, others will point out to bystanders and lurkers on the list that they do not have to take the complainer seriously. In this case "hackers as critical thinkers" is a silencing strategy, often used in conjunction with the "every space is different" trope. In related uses, "hackers are critical thinkers" is used to call everyone out on the list for falling into a logical trap, or into some form of "group think" and not thinking through an issue enough on their own. As if to say "come on, you are better than this!" In rare instances, "hackers as critical thinkers" is used to remind others that, since they are all reasonably intelligent, they should be able to have a respectful conversation with others even when

they disagree. In all of these angles, "hackers are critical thinkers" is meant to control the

conversation by drawing on the fears that someone might discredit one's claim to being a hacker.

The diversity *of* hackerspaces, and the concern for their global health

The primary force of much of the identity and definition policing seems to be the tension

between asserting that there is no central hackerspace authority, while simultaneously wanting

there to be some sort of common link between spaces. This imagined, shared connection between

hackerspaces enables enthusiasts to feel a sense of a larger, global community. However, as this

shared connection is only loosely defined, it leads to a kind of sibling rivalry between various

spaces, with each trying to define, represent, or tacitly control "what hacking is all about," both to

other hackerspaces and to society-at-large. This is especially problematic—and more easily

noticed—when an individual holds onto a very specific set of beliefs that they also tie, personally,

very closely to their hacker identity. The discussions about whether or not it is appropriate to accept

government funding illustrate this problem perfectly, where personal, anti-government and anti-

military values are espoused on the list with the assumption that, since everyone on this list is also a

hacker, they must also share in this belief system. When the individual merges these sets of

ideologies together so closely, these arguments get expressed as if they are important for the

health of the global community. These arguments for a core set of ideals that all hackerspaces

should hold draw on the tension that hackerspaces should be allowed to be individual *but they*

should also share something in common. They should be diverse, but they cannot be *too* diverse.

In the "Out with the 'hackers'…In with the 'makers' and the 'fixers'" (**4**) thread, AID15[10]

says he feels like he *has* to express his anti-military views on this list—particularly the view that

hackerspaces should never accept money from government-sponsored entities—even after others

have asked him to stop engaging in brow-beating tactics:

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[10] Some quotes from the listserv are referenced by the Author ID (AID) assigned in the analysis
process to show continuity.

AID873: If you really must, then I suppose you must. However, I'm curious as to why you feel this can't be resolved at the level of the individual hackerspaces through voting - I mean, it's not like this list is where the Mayor of the Hackerspaces will decree that you are absolutely correct and all hackerspaces must bow to your will in this matter.

AID15: True but if people from hackerspaces considering this know that, for example, members of most other hackerspaces think it is very uncool and morally questionable to take this sort of money, perhaps it will factor into their discussions and decision making.

AID873: Sorry, but without hard data to back that assertion up, that's all it is: an assertion, and an unfounded one at that. And the conversation here is far from completely indicative of how 'most hackerspaces' may feel about the matter. If it does [factor into their decision making], then they're basing that decision-making on some fairly specious logic at best. This is why I continue to advocate that each one decide for themselves on a case-by-case basis.

Throughout this thread, AID15 is hoping to generate enough peer pressure that others adopt a similar anti-military stance because he truly believes that distancing hackerspaces from the military is the best for the *global* health of hackerspaces, no matter how loosely linked they are. While AID15 does this in a way that is considered brow-beating, or even trolling in some instances, others offer similar arguments using more reasonable tones. Such as when AID628 argued that including children in hackerspaces was vital for the global health of hackerspaces:

"To be clear: The independence of spaces is very, very important. What I'm doing is advocating for my firm belief, which I'm happy to hear you call bullshit on if that's how you feel. I believe hackerspaces should engage children, and I'm trying to convince you that doing so also coincides with the growth and proliferation of the concept. If I've lost you from the go, the only thing I ask is that you not patently discourage others from attempting it."- PID8924

While it sounds accepting of diverse beliefs externally, AID628 is asking that any dissenters keep their dissent to themselves. This form of censorship is disguised as respect—either for AID628 or at least for his concerns for the global health of hackerspaces—otherwise it would be quickly called out with the quick trigger that any form of censorship usually reveals in this community.

The anti-activism or anti-politics rhetoric in the listserv, especially visible in the "Defense of Noisebridge" thread (12), reveals a desire to dissuade any discussions along a political dimension. Some participants insisted that their hackerspaces (or at least they, personally) were apolitical. Even those who explicitly acknowledged that they did not believe it to be possible to be "apolitical" still

insisted that hackers should leave their politics at the door when they enter any hackerspace. It was common on the list to call someone out for spamming too many people about their "personal politics," which was seen very negatively. This rhetoric seemed, to me, to be in conflict with the "hackers are critical thinkers" trope, which surprised me given that these same individuals were often involved in arguing for core ideals that hackerspaces should hold. There is a divide between what opinions or beliefs fall into the set of tacitly sanctioned politics in these spaces—e.g., libertarian, free speech, constitutional rights, etc. which are all systematically supported in these circles—and what would be called out as "personal politics," which seemed to be anything that was not a commonly-held belief. It is possible that this is how participants in hacker culture understand what it means to be "critical," but I find it much more likely that they place barriers around what is discussed critically and what is not. This results in the exclusion of people who see hacking and making as viable avenues for fixing social issues.

> *"Hackerspaces and like-minded groups are not places to serve the needy, they're there to create. Fixing societal problems is to be a byproduct of what these spaces produce, not its end goal. The moment that you have members trying to make it the goal is the moment the space is lost." – PID986*

Much of this seems to stem from the same set of beliefs that others also use to support their stance against political correctness (usually because it, in some way, is seen as a threat to free speech or an abuse of power by leadership). That this belief seems to be held even by a moderate number of individuals also surprised me, given the expressly political hackerspace genealogy that is quick to be recounted during nostalgic episodes. It is common during conversations that attempt to address anything social or political, especially something that touches on issues of censorship such as political correctness, for the "do-acracy" language to be thrown around. Rather than talking about these problems we should do something about them, even if we have no idea if what we are doing will actually fix the issue.

As a rhetorical strategy, "every space is different" is used in a variety of ways, including: to remind others to keep an open mind because every space is going to rest on its own set of values;

to convince the brow-beating participants that they cannot hope to control how other hackerspaces operate, because only they can define themselves; and as another version of "just ignore the things you don't like," where participants are reminded that if they do not like the way one hackerspace handles its issues, then all they can do about it is simply not integrate those practices into their own spaces. This trope is especially used to deflect or control the conversation when it is getting politically heated, and in the following quote one of the prominent participants on this thread uses the trope to calm down an argument about whether firearms should be allowed in hackerspaces:

> *I think it's important that people remember that first and foremost all hackerspaces are communities. Each hackerspace is different as the community is different. And the aggregate values of that space are defined by the people that comprise the hackerspace. There is nothing wrong with not holding the same values as other hackerspaces and their members. Nothing at all. But, it is right to accept that we are a varied global community and we will not always agree. – PID3211*

Sometimes these defensive strategies and conversational deflections are useful, especially when some participants are attempting to assert control over others. However, they stifle the grander conversation about what place hacking can have in the larger community and, as will be covered in more detail in the next section, any move to explicitly support certain groups.

Resistance to Formal Policies

The majority of these thirteen threads involved, in some form or another, a discussion of the social policies in place at hackerspaces. Many individuals, usually hackerspace organizers or board members, seemed eager to discuss how their communities operated perfectly well without formal social contracts or policies, such as anti-harassment or safe space policies, or even rules of conduct or behavioral guidelines. In this section, I discuss the tactics and justifications that were commonly used in these threads to resist the implementation of, or even discussion of, formal social and behavioral policies. The three strategies most often used were: 1) arguments that formal policies are not necessary; 2) that they would promote inequality "in the other direction"; and 3) forcing inclusivity was bad for the community already in place.

In arguing that formal policies (e.g., safe space policies or anti-harassment policies) were unnecessary, the "be excellent to each other" and "hackers are critical thinkers" tropes were often used in conjunction to present hackers as the kind of people who have the capacity to recognize when someone—including themselves—is behaving appropriately or not. Since formalized rules were argued to be unnecessary, when individuals did argue for them it was called out as a form of censorship. There seemed to be a mental disconnect between wanting to address issues related to having diverse opinions in civil ways, but not wanting to set down the ground work to implement or enforce a system of acceptable behavior.

> "Standardization of communication is the very nature of language. We are not discussing censorship. We're discussing a ruleset for standardized communication of ideas. No ones ideas are being banned. We are simply requesting that communication be kept to a standard that allows for discussion to continue on the discussion mailing list. This point has been covered to death." – PID10173

The lack of formal policies, and arguments back and forth about them, were often very heated. Later in that same thread one of the prominent authors on this listserv (in the top 20 authors in terms of number of posts over the entire corpus of emails I collected), became frustrated enough with the arguments that he actually left the listserv and did not participate for 6 months:

> "I am out. I got an inbox full of blatant anti-american bullshit this morning, and a bunch of people who morally object to stopping people from being antagonistic and hostile. I can't deal with that. I hope that at some point this list becomes usable again but, I can't invest any more time in trying to fix it. By all means enjoy your "discussion". Just recognize how self censoring this list has become. People will continue to unsubscribe from this list as groups of people treat others in a hostile fashion because they disagree with them. If you hate censorship then I cannot understand how it is you can sit here while people are chased from the list one after the next. But that's your problem to deal with now. Not mine. Bye." – PID10219

What he was trying to point out was that, formalized policy or not, there was always going to be some kind of censorship on the list. By not setting down actual rules for behavior, the people who benefit are the very people that are often complained about—either for being aggressive, antagonistic, or for trolling—and the people who suffer are those who feel that these environments are too hostile to participate in.

Other arguments against formalized policies similarly came from a place of privilege, made obvious by the fear that formalized policies would create inequality in the opposite direction, much like the kinds of arguments heard from people who are against affirmative action measures.

> *As a further nit-pick, almost by definition a "Safe Space Policy" promotes and enforces what I'd term inequality; it artificially empowers those who are willing to appear vulnerable/disadvantaged/non-privileged. – PID1881*

This idea that some people are more "willing to appear vulnerable/disadvantaged/non-privileged" than others plays off of the fear that someone could abuse this willingness in order to censor people who were not so willing to be vulnerable. What results from this is some way to continue being exclusionary while couching it in language that sounds like an attempt to be considerate for the people who already enjoy these spaces.

The third prominent argument for not creating these formal policies uses a similar angle of appearing to care for the community who already uses the space, but rather than fearmongering about the potential for censorship, the argument in this case is that attempting to "force" inclusivity is only something that one would do if they were a bad community member or one who did not care about the community, because it would require forcing a change that might not "fit" well in that community. One member drew on his authority within this listserv environment to try to convince others that hackerspaces, in fact, should *not* try to be inclusive because that was never their goal:

> *"If you think that your hackerspace can be home to all the peoples, you aren't building a hackerspace you are building a public library, and by all means enjoy the crackheads and good luck keeping that inclusive to everyone. Ask noisebridge how that went for them. […] If your goal is to enfranchise the disenfranchised because you feel this is a grand and noble ambition. Let me stop you right there. The hackerspace is not a social revolution space. It's a hackerspace. Does your social revolution really belong there? Seems like you might be better served engaging in your social revolution somewhere with a focus on that sort of thing. Maybe the YMCA? The local library? Tahrir Square? I don't know, but probably not the room filled with socially dysfunctional iconoclasts with a penchant for digital havoc. Take that shit outside. You are being a bad member of your hacking community and it's really not cool […] So, as far as safe spaces... your hackerspace isn't one. It probably shouldn't be one. I don't think you really understand what a hackerspace is if you are asking these sorts of questions, or you really don't care about your hackerspace and are just trying to take advantage of it to further your own shit. In which case you are a terrible*

person. Don't be that person." – AID558

This email pulled a lot of weight in this conversation, but someone else responded with a "quick

edit" of the conversation:

> *"blah blah blah white guys only is just fine because they deserve it and we should never make a point in diversifying it because I like it just fine since I'm white and male or whatever you want to fill in here" – PID1808*

And another participant went further to point out the privilege bound up in making such claims:

> *"When a white male heterosexual says 'We don't have a discrimination problem!' 'I've never seen any discrimination!' or 'An anti-discrimination policy is just silly,' it is coming from a place of privilege. Such people are the majority of folks at hackerspaces and in technology. OF COURSE they feel comfortable. Every hackerspace is set up to cater to them and their, often unconscious, perceptions and biases. They'll feel right at home. Ask a woman or a queer person of color their impression of hackerspace culture and hackerspaces they've visited or just how one is often treated if female and you'll often get a very different viewpoint." – PID1818*

These arguments against trying to be explicitly inclusive were centered on the claim that attempting

to do so would disturb current community members, much like arguments for requiring that new

members must "fit in" with the member-base that currently exists in these spaces.

A few participants were able to propose and discuss strategies that seemed to fall in the

middle ground between implementing formal policies and leaving it up to the community to

handle. However, these strategies seemed to require significantly more effort to implement and

were more bureaucratic in nature, which was an instant turn-off for many hackers. One such

strategy was explained here:

> *"The process sounds a bit involved, and we've never actually voted out a prospective OR found anything worrisome on a background check, but the process creates a few important feelings within the space: - Everyone is responsible for talking with new members and explaining the shop, which inspires a sense of ownership - something our spaces are always struggling with. - People are put in the position of having to "rep" for their prospectives, which makes them ask thoughtful questions. You get social capital for bringing in cool people, so members are always on the lookout. - *Everyone* gets a chance to vote on new members - no one ever gets to say, "I always thought he was trouble!" Future problems get resolved easier because no one feels like they don't have a voice in the membership. - New members feel like a part of the team more quickly, because they know that (nearly) every member has heard about them, asked questions about them, and voted on them. - Background check may discourage undesirable people from even going into the process if they know that people are going to be looking into their past a little bit. We make it clear*

*at the beginning that simply having something show up on the check is not necessarily a
disqualifier, just something to discuss." – PID4118*

In the same thread, another author proposed that creating an inclusive space could only be solved

by first setting an example:

> *"My advice would be, if your goal is a respectful, diverse hackerspace that attracts women
> and minorities to become members and contribute, then cultivate that environment first. A
> policy is not going to magically create it for you. This is critical, too: leadership MUST set an
> example in this area. Be respectful of ALL your members, online and offline - I would even
> go so far as to say as a leader, don't argue with any member on a mailing list. Talk to your
> members in person. Finally, you have to maintain the policy. Enforce it, warn members, and
> also carefully screen people that seek membership. We've put the brakes on a couple of
> people that were clearly never going to respect women, and shown them the door" –
> PID1792 [after describing what helped their safe space policy be successful]*

Formal policy or not, without an example for the community to work from, the space would remain

exclusionary.

Conclusion

In this chapter, I have demonstrated how this listserv, through which many members of

many hackerspaces participate, is often used as a way to define and control the reproduction of

hacker culture, values, norms, and ethics. In the next chapter, I will begin to objectivate how issues

of diversity and inclusion are understood on a broader scale in the hackerspace movement, and

investigate more deeply how the policing behaviors described in this chapter play a role in

supporting systemically exclusionary informal social and behavioral norms.

CHAPTER 7: DISCUSSION

In this chapter, I will synthesize the findings introduced in the previous three chapters through a care ethics lens. I rely on Stephanie Collins' dependency principle, which she presents as the core normative commitment of care ethics, to help focus this lens while being careful not to apply the principle in an overly prescriptive manner. I will demonstrate how developing an identity as a hacker is an interdependent process that relies heavily on the validation of one's peers. I will then explore how care and vulnerability are necessary components of hacker communities, and how the hidden or tacit nature of the mechanisms through which caring actions are performed enables hacker communities to align with a broader, contradictory hacker ethos. I will also discuss how the implementation of informal social mantras and formal social policies serve to limit the ability for hackerspaces and their members to perform their duties to their communities, while also appropriating the language of care. Before I can make these claims, I will first revisit the dependency principle I introduced in Chapter 2, and discuss how it applies to the moral duties hackerspaces take on through their claims.

Hackers and The Dependency Principle

In *The Core of Care Ethics* (2015), Stephanie Collins presents the dependency principle as the core normative commitment that ties together care ethics scholarship:

> *If an agent is well-placed and best-placed to meet someone's important interest, then the agent (set) has a duty to do so.*

In this chapter, I use the dependency principle as a lens for analyzing the normative commitments that hackerspaces and the hacker movement claim or should claim, as well as to evaluate how effectively these normative commitments are carried out.

Hackerspaces, as collectives, have two primary moral duties. The first is to care for their members and participants as they navigate the heavily interdependent process of developing and performing their identities as hackers. The second moral duty is to provide a welcoming and inclusive atmosphere for anyone who holds an important interest that could be fulfilled by

becoming a member of such a community. These moral duties are based on how hackerspaces, as collectives, present themselves, where they claim to be both best-placed and well-placed to help individuals learn to become empowered, self-sufficient, or independent (but not in so many words). These moral duties are also based on how such spaces have come to rely on systems of interdependence, which I will explain below, despite explicitly espoused values of independence and self-sufficiency.

Throughout this chapter, I discuss how hackers, hackerspaces, and hacker culture succeed in fulfilling the first moral duty, but fail to fulfill the second. In the Implications section at the end of this chapter, I argue that, in light of this failure, hacker communities must choose either to abandon their collective claim that everyone is included and welcome in these spaces and re-scope the impacts they espouse to have—making it more clear who is and who is not able to be represented in these groups—or to work to be more inclusive in an explicit way, despite imagined costs to current community culture.

Developing an Identity as a Hacker is an Interdependent Process

A common theme throughout the three previous chapters is that there exist multiple hacker identities and subjectivities, with equally as many ways to express those identities. In Chapter 4, I demonstrated how the hackers in Null Alpha learned to identify as hackers by developing a tool and material sensibility, adopting an adhocist attitude toward their projects, and becoming part of their communities. In Chapter 5, I showed how members attempt to support this hacker diversity by encouraging members' interests and by helping members become self-empowered in their own ways. And in Chapter 6, I walked through how the discussions on the listserv can often be derailed or controlled, in both productive and stifling ways, simply by mentioning just how valuable it is that these multiple hacker subjectivities exist and are allowed to exist.

Attaching to a Particular Tool or Skill

Despite this explicit acknowledgement, on multiple levels, that these multiple identities exist, a significant aspect of *expressing* one's identity, at least in Null Alpha, was tied to how a member was referred to through the skills and tool expertise they had developed or offered to the community. When this took place—such as with one member's affiliation with the welding equipment, and Dave's association with being "Laser Dave"—it appears that this pairing of hacker to skills resulted in that hacker focusing on that particular tool expertise, perhaps more than they otherwise would have. Laser Dave's case is particularly enlightening. Before Null Alpha acquired the laser cutter, David would bring a wide variety of projects to the space to work on them, from needle felting projects to building storage solutions for the ever-growing clutter around the space. After the laser cutter and the inception of "Laser Dave," the vast majority of his projects became laser cutter related. I do not claim that Laser Dave was an identity forced onto Dave against his will, but rather that this identity was co-constructed and is intimately tied to both his ability to provide a service for the community by helping others figure out how to incorporate this new tool into their own practices, as well as by his need to be validated as an important member—and therefore established hacker—within this particular community.

Hackers in these spaces often latched onto certain projects and skills fairly quickly, and these skills usually imply something physical, or something that they can point at to other people as a demonstration of their hacker-ness. Part of what makes "hacker" such a tenuous identity to adopt is that it is difficult to prove or demonstrate, outside of these physical manifestations of having done something unexpected. Having one's project be referred to as a "proper hack" and showed off within the space, as we saw with several examples in Chapter 4, seems to be an implicit goal of many projects. Clever software hacks and scripts, on the other hand, are rarely talked about with the same level of enthusiasm, either in Null Alpha or on the listserv. I believe that one significant reason for this exclusion of digital artifacts and skills is specifically because these

intangible skills are less visible, whereas their physical counterparts are better at serving as "proof" that the hacker belongs. When in such an environment where skill sets are diverse, hacking together a series of cords that very obviously do not belong together is more impactful to a larger audience than performing a clever trick in a programming language with which only a handful might be familiar.

External Obligations and Hacker Performances

This latching on behavior appears to exist in a positive feedback loop, linking hackers with their place in the community. As members develop expertise with a set of tools, they also become a public educational resource, with obligations to the community and occasionally to the public. Laser Dave, for example, does not get to be Laser Dave if he only laser cuts for himself. Nolan and Jennifer do not get to be the cool hackers who can do anything and teach anything by working only on their own projects. The dependency relationships they develop between other members and their communities become core aspects of their identities as hackers. This *performance* of identity is how they come to announce to others that they hack—that they are good people because they hack for and with others. On the other side of this dependency relationship, other members of these spaces need resources like Laser David, Jennifer, and Nolan around for a range of reasons often brought up in the Discuss listserv, as well as represented in the hackerspaces.org hackerspace design patterns. Such members inspire others to engage in hacking more completely, help members when they are stuck or discouraged, and serve as reminders for what it is like to develop such an expertise. The "Strong Personalities Pattern" describes these members in the following way:

> *"Look for strong personalities as members of your original group. You will need people with experience in building structures. Look for people who have authority (and get respect), not for people who use authority (and get laughed at)."*

It is interesting to see how these interdependent relationships quickly develop, how the "established" hackers rely on the dependence of others to perform their identities, and how the others rely on the established hackers to be able to participate in the space in the first place.

Vulnerability and Validation

This kind of interdependence that pervades the development of hacker identities reveals a vulnerability that may be inherent in any such identity adoption, but is particularly interesting in this community because of how strongly vulnerability contrasts with the overt hacker rhetoric of independence and self-empowerment. Without the encouragement and validation of others participating in hacking communities, many of these participants would not be able to connect with hacking as an identity, much less construct and perform their own hacker identity. In my experience as a researcher in Null Alpha, I was similarly responsible for validating hacker identities, and witnessed first hand how members engaged in behaviors that were often tacit requests for identity validation. In Chapter 5, I explored how these validation measures are often performed subtly and tacitly when they involve member-to-member interactions. This validation occurs by inviting someone to join in a collaborative project, actively listening to their ideas and questions with enthusiasm even when they were repetitive, and downplaying one's own skill in order to boost the confidence of another. As a researcher in this space, the identity validation requests I received from members were more visible, though still not explicit. This was likely because I was seen as an authority on what was or was not typical behavior for hackers, which led to its own set of complications that I will discuss in the concluding chapter.

Taken together, these validation-seeking behaviors demonstrate how declaring oneself a hacker can be vulnerable—precisely because hackers depend on the validation of others who are similarly, and often tenuously, tied to the label. In-person validation experiences in Null Alpha were only ever positive; I never witnessed or even heard of an instance where a member was told they either did not belong or that they could not call themselves a hacker. Arguments can be made

either way about whether this is actually helpful (e.g., by bolstering the confidence of all members to approach problems in their lives from a DIY or hacker standpoint, if that's the true goal of being a member in the space) or if that could overall be damaging to the hacker image (e.g., if anyone with any level of experience can just walk into a hackerspace and be a hacker, does that not water down or ruin the image of what hackers are "supposed" to be like?), but those arguments are outside of the scope of this dissertation.

While the in-person interactions at Null Alpha appeared purely positive, the Discuss listserv provides a helpful counter-example of community policing of the hacker image. All of the threads I introduced in Chapter 7 involved arguments about what behavior does or does not count as hacking, either to a small degree or in explicit form. The lack of consensus on what should comprise the hacker image, as demonstrated through recurring and often contentious arguments, could indicate that the listserv is simply not the place for these types of discussions to take place. However, since the Discuss listserv seems to be the only system through which members of different hackerspaces are able to discuss what it is they are all sharing, in a broader sense, then perhaps this lack of agreement is actually indicative of how much the local community influences the hacker identities and experiences that can develop. While it is unclear what the balance of participation was in this listserv between small-town hackerspaces such as Null Alpha or larger and better-known hackerspaces like NYC Resistor or Noisebridge, it was clear that claiming to be from a large space was often used as representation of authority over how hackers should behave. If this much variability exists among hackerspaces, then it is no surprise that so many hackers seem to need the kind of external validation I have described. I will build on hackers' need for external validation, arguing in the next section that vulnerability and corresponding acts of care are critical to the success of both individual hackerspaces and the hackerspace movement as a whole.

Care and Vulnerability Are Critical to Hacker Culture

If the process of adopting a hacker identity is intimately tied to the interdependent relationships one develops in a community of hackers, and if helping others develop these identities and assimilate into these communities is what makes them successful, then the mechanisms used to nurture this process are necessary for the success of hackerspaces. In Chapter 5, I discussed how these mechanisms can be described within Dennis' typology of care (2003), which explicates the strategic difference between caring mechanisms that are foregrounded (overt-explicit), somewhat foregrounded but not discussed (overt-implicit), and hidden from the care receiver (covert-implicit). I used the distinction between these caring acts to demonstrate how the relationships that Null Alpha's members actually develop with each other and toward their community are different from what the typical "hacker culture" rhetoric would be able to account for, and that this tension can be productive. In this section I will argue that the divide between explicit and tacit mechanisms of care are useful in maintaining a hackerspace's alignment with the overall hacker ethos, and that much of the work of distributing care labor is done through shared hacker mantras.

Care in Person and Globally

Foregrounded and explicit caring activities are acceptable among hackers when they are motivated by a desire to teach, to learn, or to participate in activities that directly benefit the community. These explicit mechanisms align with a boilerplate hacker ethos, and are the only types of care or volunteer work mentioned in the hackerspace design patterns online, in the listserv conversations I analyzed, or were explicitly mentioned in in-person interactions. I also observed less explicit forms of care within Null Alpha, such as how visitors were welcomed to the hackerspace or how they would attempt to make sure that others felt like they fit in with the community as hackers and as friends. However, discussions of this sort of behavior on the listserv were less common, and were often limited to the operationalization of behavioral mantras, such as "be excellent to each other," which I will explain in more detail below.

The even further backgrounded acts of care I observed were those that allowed and enabled members to be somewhat vulnerable with each other without calling direct attention to those vulnerabilities, either by admitting knowledge gaps that could be improved through further practice, or by hinting at concerns that they might not belong. These backgrounded acts of care sometimes took the form of downplaying one's expertise to help another feel more at ease, and were often performed to reassert and establish the hacker identity claims of other members. These types of caring behaviors never appeared in the listserv emails I analyzed, but this is not surprising because if these behaviors are only supportable through tacit and backgrounded actions, then it would be almost impossible for them to come into play in an online discussion forum among strangers which is, by its very nature, explicit. I do not believe that Null Alpha was unique in modeling caring behaviors and attitudes in this way, but rather that each group has to make a similar translation between behaviors that are allowed to be discussed because they fit the hacker ethos, and the behaviors that actually have to take place for the hackerspace to function as a community.

Backgrounded Care Through Behavioral Mantras

Taking the place of backgrounded caring behaviors were informal behavioral mantras that were often suggested as replacements for formalized social policies, which as I demonstrated in Chapter 6 are heavily resisted by hacker communities. Three such mantras that dominated the conversations in the threads I analyzed (and which I also found in my data from Null Alpha) were: 1) the "do-acracy" principle that many spaces, including Null Alpha, claim to be at the core of their group functions; 2) the "just ignore what you don't like" response to situations that deserved better, more caring reactions; and 3) the overwhelmingly dominant claim that "be excellent to each other" should be able to stand in place for any formal social policy in order for everyone to get along and be treated fairly. These mantras pervade the hacker movement, and can be seen clearly throughout not only hackerspaces and the hackerspaces.org listserv, but also Maker Faires, talks

done by Mitch Altman and other prominent members of related movements, and groups that have

been appropriating hacker rhetoric, such as co-working spaces and fabrication labs in educational

contexts.

"Do-acracy"

When hackerspaces claim to be a do-acracy, what they mean is that they expect their

members, individually, to take charge and do what needs to be done, when it needs to be done.

This is meant to be empowering, and it occasionally is: when participants find a tool that is broken,

they are encouraged not to find someone else to fix it, or to even ask someone if it is okay to fix it,

but to just fix it themselves. If they want to clean up a space, they do not have to find the person

"in charge" and ask them, they should just clean it up. The basic premise is to ask for forgiveness

rather than permission. The "do-acracy" nature is supposed to be able to apply, theoretically, to

any aspect of the hackerspace, since any member is as much of a co-owner as any other member

due to the flat-hierarchy in play in the majority of these groups. However, newer members to these

spaces often have a hard time picking up on the implications of this principle. One listserv author

tried to explain how it is difficult to get shy people involved in the do-acracy of their space:

> *"The difficult challenge is always working out how to get brilliant or unusual or unspotted people who are reticent to get involved, feeling like they *can* get involved, without also either scaring away confident people who are good at stuff but are unused to being challenged, or attracting super-confident people who break more things than they fix. I think our current working pattern is to shout at the people who break things, while ensuring that they find something that they can do, and then praise them to the skies when they do that instead" – PID4144*

In Null Alpha, this difficulty was addressed in a brute-force sort of fashion, usually with Jennifer

explicitly reminding people, "This is a do-acracy, if you want something to happen, do it!" She

often used this tactic during meetings to convince people they they were just as capable of

organizing the clutter, taking out the trash, or representing Null Alpha at events around town as

much as any other member would be.

"Just ignore what you do not like"

"Just ignore what you do not like" is similarly focused on an individual's responsibility to make hacker environments work for her, rather than the other way around. When it came to logistical matters of the listserv, this approach was often suggested when someone would complain about something being offensive on the list. The basic idea was that if everyone just managed their email clients better and learned how to filter out emails from undesirable list participants, they would be able to ignore the "trolls," or people they simply did not like, and nobody would have to be appointed as moderators, a position that, in these circles, is the very representation of a limited freedom of speech. The final thread I discussed in Chapter 6, in which a member complained about being "unfairly" kicked out of his hackerspace, demonstrated how "just ignore what you don't like" approach could be taken to an extreme and eventually break down. The member thought he had been unfairly banned and argued that people in his hackerspace who did not like him should have just ignored him, rather than reporting him. Throughout the thread, others tried to give him advice about moving on and creating his own hackerspace, or learning to "chill out and be easier to deal with." His response to their advice was:

> I'm chilled. The problem isn't coming from my side.
> The problem is people who don't like being told why they're wrong.
> Why don't they be all chill and just ignore me?

His argument against every piece of evidence brought before him about why the other members of his hackerspace might not like him—including such advice as "don't call people by the wrong pronouns on purpose just because you think it's funny" and "don't call people stupid just because they are not willing to discuss what you call 'philosophy' with you"—was that those members should have just ignored him. This "just ignore it" practice existed in Null Alpha as well, but to a lesser extent, and it was rarely articulated as ignoring something offensive, but rather as allowing others to use the space how they felt they needed to. One particular example of this was when a group of regular visitors, but not members, began hosting workshops for their children during Null

Alphas public hack nights. That they were hosting these space-consuming workshops without really contributing to the community directly, and without including others in the community, annoyed many of the members in the space, but since there were no specific rules about it taking place, these workshop squatters were ignored, sometimes passive aggressively.

"Be excellent to each other"

The most prevalent behavioral mantra used to describe interpersonal responsibility regarding social behavior was "be excellent to each other." In many instances it was argued to be able to prevent or solve any interpersonal conflicts that might arise in these communities, and as a result was often used to replace more formalized community rules, such as anti-harassment or safe space policies. If everyone is excellent to each other, then everyone can solve their own problems, and moderators, safe space policies, and formalized rules of conduct or behavior are unnecessary because nobody can be offended when everyone is nice and responsible for their own actions; it is the recipe for a perfect, libertarian utopia. The problem with this line of thinking surfaces every time someone has to be convinced that their behavior has not been excellent, because nobody ever thinks they are in the wrong. Nolan from Null Alpha shared a story of such an instance on the Discuss listserv, where he and other board members had to explain to a homeless member living in Null Alpha that his behavior was not excellent, even if it was not directly against any rules:

> *"We wanted to continue to work with him to resolve this situation, however when confronted about his behavior it turned into an excuse fest with nothing resolved. He wanted us to define specific rules to which he could abide. We have only two rules 1. Don't be on fire 2. Be excellent to each other - which has worked well for a few years now. At this point he decided to leave of his own accord. One thing we realized was that our only recourse if he had not decided to leave was to hold a vote and terminate his membership. We never wanted to do this, but we needed a way to communicate to an uncooperative member that their behavior was unexcellent, so upon his departure we added a probation clause to our bylaws. […] It was a sad incident as this person was interesting to talk with and otherwise had things to offer."*

Everybody's behavior can be rationalized as excellent in some way or another, given enough time to craft a justification. In this short example, it is clear how "just ignore what you do not like" and

"be excellent to each other" create a tension that prevents people from confronting others about their behavior for fear of rocking the boat.

Individual v. Collective Duties

Each of these behavioral mantras focus on an individual's responsibility within and toward the community while ignoring, in a typically libertarian way, the collective and shared duties of the community. However, these principles are also more moderate than what is suggested in the hackerspace design patterns and through similar hacker manifestos, which often suggest that these duties should simply be assigned to members, without describing either the process by which these duties are assigned, or the position of the person who should be responsible for doing the work of assigning. In the "flat surface problem" hackerspace pattern, which describes the pervasive clutter problem faced by what seems to be every hackerspace, the following language is used: "Regularly assign someone to declutter. Alternatively, throw away everything on the flat surface. End of discussion." In the "Responsibility Pattern," which describes the problem faced by those who had previously been responsible for running or organizing a part of the hackerspace infrastructure, but "feel the sudden urge to slack," the solution to this problem is described:

> *"Just because volunteer work doesn't get paid doesn't mean it's less important. Remember that you will directly hurt your friends and the hackerspace. Take pride in your volunteer work. It will make you grow stronger as a person and is satisfying. When you realise that you really cannot do the job anymore, your last task is to hand it over."*

Volunteering—or overt acts of care and maintenance that the hackerspace requires to thrive—is defended against the comparison to paid labor and explained as something that needs to be followed through with, or else one risks hurting their friends and the hackerspace. However, take note that within this description of volunteer work it is implied that any one job is handled or led by a single individual, and that there is no mention of sharing a task load equitably. These explicit mechanisms align with a boilerplate hacker ethos.

In Chapter 5, I explored how members hide their care practices by embedding them in hacker-sanctioned mechanisms, such as through their projects and their tool use, but we can see

how this also extends to the explicit rhetoric surrounding hacker culture. Adopting this rhetoric might be a way to further mitigate the vulnerability of adopting the hacker identity, because it is much easier, at least at first, to adopt this language in order to "fit in" with the group than it is to be able to demonstrate belonging through developed skills. And the explicit, libertarian mantras, epithets, and tropes are much easier to adopt than other, more nuanced ones might be. For example, "be excellent to each other" is much catchier and easier to grasp than "how you treat people can be complicated and has to depend on how that person wants to be treated, how they need to be treated, and the capacity you personally have for treating them the way they deserve to be treated." As I discussed in Chapter 5, attempts to meet in the middle between these two approaches are often clumsy and break down, such as with the gamification of maintenance in the space, which didn't seem to hold up because there was a mismatch between intrinsic motivations to work toward the success of the community, and the extrinsic rewards given by the badge system.

While problematic in their own ways, which I will discuss further in the next section, these informal behavioral mantras that seem to pervade hacker culture do, in fact, accomplish some of the bridging work that is needed between the pervasive and explicit hacker ethos of self-sufficiency and independence on one hand, and the actually enacted community atmosphere of care and interdependence on the other. That these behavioral mantras exist may indicate how many within these communities recognize, at least tacitly, the vulnerability that can be felt when joining a space and calling oneself a hacker. As with the covert-implicit care tactics I introduced in Chapter 5, these mantras represent, in their own ways, a different set of caring mechanisms at play that attempt to hide in the liminal space between two contradictory ethical and moral stances. By hiding in this liminal space, they allow participants of these communities to continue claiming membership in the broader hacker culture without having to acknowledge the internal inconsistency.

Exclusionary Practices Disguised as Care

While the tacit nature of these caring mechanisms helps hacker communities feel more aligned with the hacker ethos, it also supports exclusionary practices by orienting the care performed through these mechanisms solely toward the community, and away from those outside of it. In this section, I will describe how the language of "fitting in" with the current hackerspace community is framed as a measure that protects the community's current culture. I will then describe how the informal social mantras I presented in the previous section privilege the majority interest groups of these spaces and marginalize underrepresented groups. I conclude with a discussion of how these mantras also serve to limit hackers' abilities to engage in discussions about complex social issues, such as issues of diversity and inclusivity.

"Fitting In" as Paternalistic and Exclusionary Care

In Chapter 6, I discussed the resistance that was demonstrated on the listserv toward the implementation of formal policies and rules, and I presented one possible explanation as a form of fear; fear that the introduction of explicit policies might, in some way, negatively change the culture of the community. This included the fears that formal rules could limit their freedom of speech, or make it possible for them to be falsely accused of being offensive or of demonstrating un-excellent behavior by someone who is "willing to appear vulnerable." Even in the arguments against introducing moderators to the listserv itself, there were strong overtones that attempting to be inclusive in this way would somehow damage the current community culture. Initiatives to increase diversity or build the capacity within the community to be more inclusive were often framed either as costs to hacker culture, as attacks on freedom of speech, or simply as "personal politics," which many participants argued as having no place in their communities.

Fitting in with the members already in place, whatever the makeup of those members happened to be, was always prioritized in discussions about inclusivity and diversity, and how those desired outcomes intersected with the implementation of or resistance to formalized rules. This

need for new members to "fit in" is formalized in the single dissenting vote rule, where any potential member's application to join a space would be shot down if any current member voted that they not be included. This rule seems to naturally fit with the consensus organization structure that the majority of hackerspaces adopt, and is usually justified by arguing that it protects current members from those who would not fit in. However, what is never explained is how it is determined whether or not someone fits in. While hackers are supposed to keep an open mind about who does or does not make them uncomfortable (hackers are, after all, "critical thinkers"), it is all too easy to use language that does not sound discriminatory on the surface to hide discriminatory practices. Calling someone out for not being a "critical thinker," not being counter culture enough, or for being a potentially toxic or sketchy person was described on the listserv and in Null Alpha fairly often. At the surface, a few of these sound like reasonable criteria for excluding individuals from participating in a social group, but attempting to apply these labels suffers from the same problems that attempting to label "un-excellent" behaviors does. Consider how Noisebridge is often discussed as, at best, an extreme example and, at worst, a bad example of how a hackerspace should operate. References to sketchy people and toxic members in such discussions are often used to single out the homeless population that happens to participate in Noisebridge's community more so than local homeless populations typically do at other hackerspaces. Rather than engage with the intentionally political stance that Noisebridge makes toward being inclusive of their local homeless population, it is much more common on the listserv to label the participants as sketchy, crazy, or somehow otherwise undesirable and, therefore, bad examples to follow.

When these arguments for the need to fit in with the current social group are viewed from a perspective of care, it is easier to see the common goals that are held by those who claim that formalized social policies are necessary for constructing welcoming environments and those who claim that "be excellent to each other" should be sufficient. Both of these groups want

environments where nobody is discriminated against, and they want this to happen in a way that does not have a dramatic impact on the culture that is already there, except in making it more diverse or more welcoming. One strategy favors caring for the people they already know, and the other favors an external impulse of care to include those who are not yet included. The breakdown in these arguments occur because the assumptions about the overall goals of the space are never adequately addressed. When formalized policy opponent, O, says "*we do not need explicit policies*," formalized policy proponent, P, hears, "*we do not want to change, we like our insular communities the way they are*." However, what O thought she was articulating was: "*policies are demeaning, we should be able to do this in a more organic way that does not involve setting up rules, because rules are easy to abuse and we do not like rules about* anything*, not just about this kind of stuff*." The miscommunication works in both directions, and when P says "*we need explicit policies to be more inclusive and welcoming*," O interprets this as, "*you are all doing it wrong, and you are bad people for doing it wrong, so we are going to try to control your behaviors and set up a system that will punish you even if you mess up on accident*." However, what P thought she was articulating was: "*just hoping that everyone is nice to each other is not enough, because nothing will change, and we are currently suffering from a problem where people are uncomfortable in our community because it is not clear that their safety or their concerns will be taken seriously. While it's not your* fault *that this is the case, it is your responsibility to do something about it*." Those who take a middle ground and argue that this problem needs to be addressed on and within a culture level often do not do the best job of expressing this position as a middle ground, and they are either ignored or misrepresented as one side or the other.

Privileging Current Members Over Potential Future Members

The social mantras presented above, as well as many of the formal policies in these groups, such as the single dissenting vote rule, privilege whoever is represented by the majority of the community members who are already in these spaces. Participating in the "do-acracy" principle of

these spaces, following the "just ignore it" mantra when one is offended, and learning to recognize when it is or is not appropriate to call out "un-excellent" behavior are all much easier when one shares the majority of the opinions held by the majority of the individuals in the group, and when one is already represented among the members. As a result, these hacker version of care directed toward the vulnerability of developing a hacker identity are perfectly successful at helping members who *naturally* fit in with these groups along some other metric—either by race, gender, or by already ascribing to "nerd" culture—but fail to include those who fall outside of that range.

We can see the privileging functions of these social mantras and policies by taking a close look at the responses that take place when they are tested and when their boundaries are pushed. Under the do-acracy principle, which is essentially an extension of "ask for forgiveness, not permission," what kinds of things can be done and then asked forgiveness for later? When what is changed or proposed to change conflicts with a dearly held value of the majority within these spaces, participants often react by claiming either that their freedom of speech could be encroached upon, or that these policies endanger the culture enjoyed by the current community members. The limits to these mantras are assumed, and likely exist along the same lines that distinguish between statements and ideas that are either held by the majority of members in the group and thus are "apolitical" or fall within the realm of "personal politics." What would happen if members in favor of such formal policies, acting on the principle that they should be able to take action within the space to treat it as their own, post anti-sexual harassment signs around their spaces? It is my assumption that those members likely would quickly find that the do-acracy principle only truly applies as long as one stays within the confines of the tacitly accepted majority value system in place, making it even more difficult for those who may come from different worldviews and do not understand exactly where the tacit value system ends and untouchable space begins.

These privileging functions are similarly encapsulated in the fuzziness of the "fitting in" criteria against which potential new members are judged. While this fuzziness is framed as a protective measure for the community, it has a secondary consequence that actually reduces its ability to adequately care for minority members within the group. When the time comes for a vote on a potential member's application, it requires a good deal of courage for a minority member to be that single dissenting voice, especially if her reason for wanting to prevent the applicant's membership stems from a concern that only seems to affect her. For example, if a potential applicant engaged in micro-aggression behaviors during their trial membership that only impacted one individual, and which others in the space did not notice, it would be difficult for that minority member to speak out about what took place because they would first have to characterize these micro-aggressions, which could be dismissed as "personal politics" or, even worse, as something that makes the complaining member a potentially "toxic" individual. In my time at Null Alpha, I encountered many potential applicants who casually used homophobic slurs that only seemed to impact me. As a result of my somewhat complicated position of being both a member and a researcher of the space, I abstained from all such membership votes, but it is difficult to guess how I might have behaved in those instances were I simply a member who had been offended, and how the community might have responded, or not, to my concerns.

Mantras and Policies Limit Discussion of Critical Issues

Further compounding the issue of how these tacit care mechanisms privilege majority interests in these spaces is the difficulty in conducting meaningful discussions about these value systems, which are often shut down or redirected quickly, assuming they are able to take place in the first place. The exclusionary effects of these mantras and policies are often hidden and difficult to point out. This can be at least partially attributed to the somewhat moderate language that is used in their implementation, because they seem like reasonable rules to use in governing a social group. While the do-acracy principle and the "be excellent to each other" mantra are certainly

guided by the explicit neoliberal rhetoric in the space, they are often presented and implemented in a caring way. For example, the do-acracy principle is not presented as a way to distribute responsibility in a Lord of the Flies like manner, but rather as a way to demonstrate that a member should feel as though they belong and have collective ownership of the space. Likewise, "be excellent to each other" is not described as a lazy or clumsy replacement of actual social rules, but as a demonstration that the collective membership trusts each individual to be able to make the judgment required to differentiate between positive and negative social interactions. These framings make it difficult for these mantras to be discussed in anything other than positive terms, because calling them into question seems, on the surface, like calling into question the explicit goals of providing an empowering and welcoming atmosphere.

When discussions of big issues such as diversity and inclusivity are able to take place, the implementations of these mantras often quickly get in the way of productive discussion, precisely because collective discussion is valued less in these communities than individual action. In Chapter 6, I presented one discussion that began as a sincere concern about the negative effect of using the term "hacker" over "maker" on the ability of the movement to attract a diverse audience, and ended with the proposal that "HACKING IS NOT A CRIME" stickers should be printed so they could be posted and, in theory, help others feel better about the word "hack." The first potential "solution" to the sincerely introduced problem was carried forward in lieu of further discussion, even though the best solution would actually have been to continue the conversation and raise awareness. The do-acracy principle, as with the other mantras, is individually focused, placing the burden of responsibility for carrying out a proposed solution on a single individual. These larger, more complex social issues, however, cannot be solved by any single individual, but rather must be addressed as a collective duty, which, as I argued above, can be difficult for these kinds of spaces to engage with. Big issues, such as diversity and inclusivity issues, are difficult to approach in these

groups precisely because they are complex social issues that cannot quickly and immediately be solved by an individual.

The most common alternative to immediately attempting to implement a solution to such complex problems when they are actually able to come up in conversation in the first place is, unfortunately, even less ideal: rather than someone at least attempting, however unsatisfactorily, to engage with the issue at hand, the alternative is usually for the topic to be brushed aside after being categorized as "personal politics" and not in fitting with the "apolitical" atmosphere of the space. Unless the majority of participants are affected by an issue, it can be quickly called a matter of "personal politics" and discarded as invalid discussion. That the hackers in these communities seem quick to discard issues they deem irrelevant to them may seem mean-spirited from the outside, but it is often actually motivated by care. It just happens to be a form of care that is also intentionally exclusionary, because it is a form of caring for the community's culture by being overprotective about what is or is not allowed to change.

Conclusion

In this chapter, I have demonstrated how developing a hacker identity is a vulnerable process that requires interdependent care, and that hackerspaces are equipped to facilitate this care in their own unique ways. I have also demonstrated how these unique, caring expressions can also serve to limit the ability of hackerspaces to care externally, or to be as welcoming and inclusive as they claim to be. In next and final chapter, I will introduce the implications these findings have for studies of hacking in Human-Computer Interaction research, for care ethics scholarship, and for hackerspaces and hacker culture more broadly.

CHAPTER 8: CONCLUSION AND IMPLICATIONS

In this dissertation, I have contributed to the collective understanding of hacker communities by presenting a rich, descriptive record of community maintenance and care practices as they occurred at Null Alpha. These situated hacker practices were then contextualized within broader discussion, argumentation, and negotiation of hacker culture in large-scale community email listservs. Through an incorporation of critical inquiry approaches and a care ethics lens, I uncovered some of the tacit norms reproduced in these communities, both in person and through larger discussions by: 1) exploring the complex ethical situations that are embedded in hackerspaces, both through the participation modalities afforded by their collaborative infrastructures as well as the individual hacker identities that are shaped within them; 2) deconstructing the relationships among participants that are encouraged to develop through certain aspects of these communities' sociotechnical structures; and 3) addressing, from a moral perspective, the implications these relationships have on the inclusion and support of marginalized populations. This critical and care-oriented approach has enabled me to address a gap in the literature on the sociality of hacking communities; certain aspects of hacker communities have only recently begun to be addressed in the scholarship on hacking and making, including how participants form and sustain identities as hackers, how they develop relationships with others who share these identities, and how the communities they form together support behaviors and social structures that appear to be explicitly apolitical and welcoming, but are, in fact, political, value-laden, ideological, and systematically exclusive. By framing community maintenance practices as inherently expressing collaborative care work, I have foregrounded the interrelatedness and dependency among participants in these communities, providing insights into the formation and reproduction of the global hacker ethos.

I have demonstrated through reconstructive analysis how the process of developing an identity as a hacker relies on care and community maintenance practices as part of a complex,

negotiated ethic that bridges between the espoused hacker ethos and an ethos of interdependence, community, and care. By foregrounding the interdependence among members and duties to care that are felt, but rarely discussed, in these communities, I have been able to further characterize the intangible process of becoming an "established" hacker, while simultaneously evaluating how the (non-)adoption of social policies and reinforcement of behavioral mantras (used to distribute tacit care labor) enable the fulfillment of one set of ethical duties at the expense of another. In the rest of this chapter, I will discuss the implications of these findings as they relate to studies of hacking in HCI, to care ethics literature, and to hackerspaces and hacker culture. I will end with a reflection on the research process, and the messiness that became a part of studying a group of people who I eventually came to rely upon as friends.

Implications

For Studies of Hacking in HCI

If hackerspaces and similar technologically oriented communities continue to be promoted as a new mode of engagement, learning, and innovation for computing technologies, then HCI scholars who study these spaces need to carefully consider how the espoused ideologies in these communities exist in tension with the everyday, mundane labor required for them to persist. All communities have these mundane, overlooked, or neglected forms of care that, when analyzed closely, can provide a more nuanced view than a typical description by the hacker community; the presence of these forms of care impacts our understanding regarding how these spaces *actually* function, as well as how these spaces are *experienced* by participants. I have also begun to broaden the traditional focus of scholarship in this area from individual hackers and hacker practices to the hacker movement, as it is participated in, discussed, argued about, and defined by hackers on a larger scale.

Methodologically, what I have demonstrated through this study is the explanatory power of a deep investigation that combines understandings of the tools, technical practices, and the

communities that surround them. While each of these research contexts have been discussed in isolation in HCI and related research, few studies have brought all three perspectives together in a deep and rigorous way. What I hope to have shown is that there is a certain amount of power in understanding all of these perspectives alongside each other within the sociological and critical tradition. A deep investigation into a single community for an extended period of time is hardly unique as a research approach, but what I have presented here is perhaps an interesting balance between a single-site ethnography and the national and international "movement" or "culture" (depending on who is asked) with which that community is entangled. This has allowed me to contextualize my understanding of an individual community in a way that traditional single-site ethnographies cannot. In a sense, by studying the hackerspaces.org listserv and other artifacts surrounding this hacker movement, I have access to a more complete understanding of how Null Alpha is representative of hackerspaces in some ways and is not representative in others. This allows me to identify just how tightly coupled these local communities can be with national and international conversations. This fusion of deep interaction on a single site and digital ethnographic work on a larger scale has significant potential for understandings of system structures and identity formation and sustainment, demonstrated by the connection I was able to make between the concerns I identified in my in-person ethnography (i.e., care and community maintenance practices) and the concerns being discussed and debated on the national level in the listserv environment. This connection enables me to support the validity of my concerns and research interests in a somewhat unique way, capitalizing on the power of both traditional fieldwork and engagement in online communities. Simultaneously, concerns that were highlighted in my broader digital ethnography were able to help me foreground concerns in Null Alpha with which I was not immediately aware (e.g., tensions between informal behavioral mantras and formalized social policies, which were concerns affecting Null Alpha that I did not recognize, initially, as significant).

The research I have presented in this dissertation may be understood as an emergent methodological approach to critical ethnographic engagement, situating deep ethnographic investigations of particular communities within the broader sociotechnical interactions of related online communities. This approach may easily be extended to a variety of formats and venues beyond listserv discussions, including: large-scale Facebook groups, Reddit sub-channels, and Tumblr and Twitter hashtag-supported discussions. This T-shaped pairing of broad understanding on a large scale and deep understanding on a smaller, more intimate scale can inform research in a variety of fields, including social informatics, computer-supported cooperative work (CSCW), and computer-supported cooperative learning (CSCL), among others.

For Care and Care Ethics Research

The care ethics perspectives that I synthesize and employ in this dissertation demonstrate a uniquely pragmatic and empirical application of care ethics. My analytic approach establishes the practical utility of such a perspective, particularly its usefulness in deconstructing the tacit values that can be shared by a community which would often be hidden by a dominant narrative. This dissertation serves as a rare example of how care ethics literature can be used as a lens to deconstruct and explore interpersonal interactions in a technology-focused community, providing a much-needed demonstration of the generative and explanatory power of using care ethics as part of empirically-based—and not only theoretical—inquiry (Collins, 2015). These perspectives provide a rich understanding of the roles and subjectivities through which individuals interact and relate, as well as the normative infrastructures in which these interactions and relationships occur.

For Hackerspaces and Hacker Culture

I have demonstrated how the barriers to joining hackerspaces and similar communities can be much more interpersonal than skill-based. "Fitting in" with the established community at a hackerspace is explicitly discussed as an important step in joining the community, and is systemically supported through the policies in place that control who can become a member. The

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vague and often fuzzy language around how "fitting in" is defined enables current members of these communities to argue that they are protecting the culture of their spaces while being exclusionary, supporting those who were there first or those who started the hackerspace (and people like them).

Tensions appear in these communities—with members positioned between the importance of maintaining the experience or feeling of being a part of this particular community, and reinforcing, through their inclusivity, the expressed ideals of being a place where members of the public could engage with new forms of empowerment and democratized technology access. This concern for whether the hackerspace should function as a community space (or a "third place" as many refer to it) or as a space for the broader community is at the center of many arguments. Are hackerspaces a social sanctuary for hackers and nerds who, until this point, maybe had not found anywhere else to fit in, or are hackerspaces supposed to operate as public commons, as would be suggested by the 501(c)(3) non-profit status that many such spaces file for? The answer to this question is rarely addressed directly, and many participants in these communities would assume that the answer is "both," to some extent. However, whether the public service role or the social environment role of the hackerspace is prioritized has significant implications for the kind of ethical systems that can be incorporated or supported through a group's management.

A hobbyist makerspace, for example, focuses on providing a relaxed atmosphere for people to hang out, mess around, geek out, share their interest, and feel like they belong. But a hackerspace focused on providing entrepreneurial spaces or democratizing industrial manufacturing processes must rely on a different set of rules, and a hackerspace focused on providing a public resource to its surrounding community relies on yet another set of rules. Not only *should* these rule sets be different, but how they are applied should draw on separate ethical traditions. It is not the case that one ethical tradition is always more appropriate than the other for solving such disputes, but rather that both are appropriate, depending on the type of organization.

A hackerspace that focuses on providing a public service is more likely to benefit from a deontological ethical structure that can protect itself from liability by applying a set of rules evenly to the situations that are required, but a club or group of friends participating in hobbyist activities could not employ the same standard without straining exactly the kind of interpersonal relationships that maintain those communities and ultimately help them succeed. The main concern, implicit within this tension, is not that there exist clear divisions in these spaces between hobbyist, industrial, entrepreneurial, or public-utility forms of hackerspaces, but that all of these spaces often exist in an ad hoc system of formal and informal community policies, mantras, and sanctions. When these intersecting goals are difficult to distinguish, the communities that enact them struggle to implement sufficient policies.

It is clear from my analysis, though perhaps counter-intuitive, that the exclusive nature of hackerspaces will remain unchanged as long as hackerspaces, and to some extent hacker culture more broadly, continue to cling to these un-self-critical notions that everyone is explicitly welcome to join. Many factors make it difficult to determine how the problem of representation in hackerspaces can be solved, including the ways in which each side of the policy debates within hacker culture appropriates or uses the language of care toward different orientations, compounded by the muddling of hackerspace goals that are never explicitly or adequately addressed. Participants who argue against formal policies usually fail to recognize how their lack of policies leaves substantial opportunity for informal behavioral mantras to operate in tacitly exclusionary ways by not being explicit about who they privilege and who they marginalize. Participants who argue for such formal policies are clearly concerned about inclusion, but are often not able to articulate how these policies will do the actual work of increasing representation and participation in these spaces. What is needed is a middle ground approach that could allow for a demonstration of care both for the community in place as well as for prospective members who have a difficult time imagining how they may be represented in these spaces. The dilemma is that

this kind of care labor is traditionally performed by members of the same social groups who are currently underrepresented in these spaces. Solving that particular dilemma is outside of the scope of this dissertation.

It seems that those who participate in the hackerspace movement have a choice to make about how they represent their broader impacts in society: either hackerspaces are for everyone, in which case more needs to be done to actively support *everyone* and not just the those who are lucky enough to be represented by the majority of participants; or hackerspaces are *not* for everyone, in which case hackerspaces need to alter their rhetoric to be more transparent about who is and who is not a part of their target audience and who should be able to have access to these democratized means of production and knowledge sharing; or, somewhere in the middle ground, hackerspaces are so different and serve so many different goals that, perhaps, they should give up on their nostalgic connections to "hacking" and being a "hackerspace" if what they actually embody is less of an explicit drive to democratize technological innovations, and more of a club of individuals who want to remain insular and comfortable.

Reflecting on the Research Mess

A hallmark of critical and feminist scholarship is transparency and reflexivity regarding the researcher's position within her or his research project. As I have conducted this project, I have become increasingly aware of the complex nature of my relationships and interactions with my research participants. In this section, I acknowledge this complexity or "messiness." This messiness has appeared throughout the research project, particularly in making sense of the data during collection, analysis, and write up; during this process, I have also been forced to confront the extent to which my identity has constructed and positioned my work.

I occupied many roles in my research, from the standard social science researcher roles of observer, interlocutor, and interventionist to friend, validator, caregiver, and care receiver[11]. These roles complicated the relationships I developed with my participants. I was given more formalized privileges and demonstrations of trust than non-researcher members were given, such as: early access to Null Alpha before even becoming an official member, administrative access to Null Alpha's social media presence on Facebook, which I was given without asking; as well as responsibilities I took on and was volunteered for including taking meeting notes and coordinating Null Alpha's booth at their annual maker showcase. I was also trusted on tacit and emotional vulnerability levels as well, even beyond how my role as a hackerspace researcher in Null Alpha seemed to obligate me to validate the hacker identities of my participants, which I mentioned at the end of Chapter 5. These deeper levels of trust include how my participants would share sensitive, legally gray, or intellectual property information with me that was not intended to be included in my research project (and I have left them out of my accounts) but, rather, was shared in my capacity as a friend.

A large part of developing these close relationships with my participants, which I was not initially aware of, involved becoming personally dependent on them and the hackerspace itself as a sort of "third place" (Oldenburg & Brissett, 1982). Although this was technically a work place for me, it also felt like a space where I could be a version of myself that was somewhat separated from my home and work lives. In fact, I would occasionally be intentional about visiting Null Alpha in a non-work capacity so that I could spend time hanging out with the participants who had become my friends (though, inevitably, something interesting would happen and I would be quick to pull out my notebook or send myself a quick email describing what took place so that I could reflect on it later). I eventually came to depend on these relationships as much (or even more so) as I did on my non-Null Alpha relationships, and this interdependence included an inherent vulnerability, as all

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[11] For a methodological reflection on these roles, as well as the set of questions that my co-authors and I developed as a result of this reflection, see (Toombs, Gross, Bardzell, & Bardzell, accepted).

relationships do, to potential emotional distress. This included: feeling left out or disappointed when participants did not include me in exciting projects or show up when they said they would; feeling discouraged when participants would dismiss my input in an intellectual discussion; and being offended by insensitive remarks that were not directed toward me but did implicate me. These disappointments with participants when they canceled plans or made offensive comments did not stem from professional concerns—research-wise I had plenty of time to make up for cancellations, and offensive comments are much more interesting than inoffensive ones—but rather stemmed from a deep, personal desire for my participants to like me. It was not just that developing these friendships would make the research easier, but also that, on a fundamental and personal level, I valued these connections and sought the same kinds of validation as my participants.

As a result of these deep, personal relationships I developed with my participants, it was difficult and uncomfortable for me to call out the systemically exclusionary environment that Null Alpha has adopted from hacker culture at large, particularly because I felt very welcomed there. This gut reaction to avoid calling my participants out pushed me, perhaps too quickly, away from blaming my participants for the underrepresentation of minorities and women in the hackerspace toward discussing these issues from a systemic perspective, which only implicates my participants, rather than holds them responsible. While this systemic perspective still appears, to me, to be the most accurate mode of describing the issue, I have to admit that on some level this may be because I care for my participants in such a way that any alternative to calling them even somewhat sexist or bigoted is preferable.

Moving Forward

The concerns regarding the inclusivity and actual welcome-ness that hackerspace environments create become more poignant when we consider how hackerspaces and hacker culture are currently being appropriated in new contexts or reproduced beyond their traditional

boundaries, such as in elementary schools, public libraries, and workplaces. Should (or can) the hackerspace model be used to address the underrepresentation of women and minorities in STEM fields (e.g., Buechley & Hill, 2010)? If the care ethical duties within these spaces remain imbalanced, where the insular duties outweigh the outward facing duties, then this appropriation of hackerspaces is not likely a good fit, and risks casting women and minorities in the role of not engaging or "fitting in" correctly. A primary difficulty with hackerspaces attracting a more diverse set of participants appears to stem from an over-attachment to nostalgic hacker rhetoric that cannot account for how *communities* must function in order to fulfill their members' important interests. This forces individual hacker communities to undertake significant translational work between how hacking and hackerspaces are "supposed" to work, and how they actually need to work to succeed interpersonally. What I have shown in this dissertation is that this translational work, primarily in the form of behavioral mantras and a minimum threshold of social rules, is quite effective at caring for current members and especially members that are well-represented in these spaces, but fails to address those who are not as well represented. A continuation of scholarship that only focuses on the positive elements of hacker culture (largely derived from the nostalgic "hacker ethos" rather than actual hacker practices) will not only limit the participation of underrepresented groups in traditional hackerspaces, but also potentially result in similar exclusionary environments in appropriated versions of hacker culture.

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APPENDICES

Appendix A: Interview Protocols

Interviews about barriers of entering the hackerspace

Interview protocol for hackerspace members (or regular attendees)
     Topic Domain: Barriers of Entry and Barriers of Interest to the Hackerspace

     Lead-off Question: How did you first learn about hackerspaces?

     Follow-up Questions:
- What was your first impression of the concept of hackerspaces?
- What was your first impression of this particular hackerspace?
- Have you been a member of any other hackerspace or have you ever visited any other hackerspace? If so, what did you think about that hackerspace, and how do you compare it to this one?
- Why did you (or did you not) become a member?
- What was the process like for becoming a member (or remaining a non-member but still regularly attending the public meetings)?
- How do you feel about your place in this community?
- What is your role in this community?
- How do you describe hackerspaces to other people?
- Do you engage with newbies to the space during public meetings? If so, what do you normally talk about? Do you try to "sell" the space?

     Covert categories:
- Difficulty of becoming engaged with the hackerspace community
- Difficulty of becoming interested in the concept of a hackerspace, or the maker movement.
- Thoughts on lowering or raising the barriers of entry to the hackerspace
- Thoughts on presenting a more enticing view of the hackerspace to solicit higher levels of interest by non-members or "newbies"

Interview protocol for hackerspace "newbies"
     Topic Domain: Barriers of Entry and Barriers of Interest to the Hackerspace

     Lead-off Question: How did you first learn about hackerspaces?

     Follow-up Questions:
- What was your first impression of the concept of hackerspaces?
- What was your first impression of this particular hackerspace?
- Have you been a member of any other hackerspace or have you ever visited any other hackerspace? If so, what did you think about that hackerspace, and how do you compare it to this one?
- How have you felt since attending this hackerspace?
- Have you interacted with any of the current members or regular attendees? If so, how have those interactions made you think or feel about this space or this community?

Covert categories:
- Difficulty of becoming engaged with the hackerspace community
- Difficulty of becoming interested in the concept of a hackerspace, or the maker movement.
- Thoughts on lowering or raising the barriers of entry to the hackerspace
- Thoughts on presenting a more enticing view of the hackerspace to solicit higher levels of interest by non-members or "newbies"

Interviews about self-made tools
> **Topic Domain:** Thresholds of purchasing or producing in hackerspace projects

> *Lead-off Question:* Can you tell me about this project?

> *Follow-up Questions*:
- Why did you decide to make this?
- Is there some commercial version for this tool?
    - Why did you make it, rather than buy it?
- What is the purpose of this artifact or tool?
- Will you be able to use this tool in future projects?
    - If so, how?
- What does it do?
- Were you influenced by any other projects you've seen?
    - If so, how?
    - What projects?
- Can you walk me through the process involved in creating this artifact?
    - What was the original plan?
    - Did you run in to any obstacles with that plan?
        - If so, what were they, and how did you overcome them?

> *Covert categories of interest*:
- Factors that influence the decision to make a tool or an artifact rather than purchase a commercially available version.
- Philosophical and/or political positioning behind the decision to make the artifact or tool rather than purchase it.

Interviews about the role of the hackerspace in members' everyday lives
> **Topic Domain:** The Role of the hackerspace in their daily lives

> *Lead off question:* Can you tell me about the last time you came to the hackerspace, and walk through the whole process of getting here, what you were feeling, what you hoped to get done, and anything else you can think of about the experience.

> *Covert Categories of Interest:*
- The distinction between the hackerspace as a workplace and as a social gathering space
    - How important is this distinction?
    - Does it matter to the hackerspace members?
    - Are they bothered when the space is used more for one kind of thing and not another?
- How important is the hackerspace for them?

- o Is this something they even think about?
- o Where would they go if they had to replace the hackerspace?
- What do they think about the other members of the space?
  - o Are they friends, are some of them friends others just in the way, do they all play an important role, etc.?
- Is this a "third space" for them?
  - o How to they think about the relationship between the hackerspace, their work, and their homes?

Possible Follow-up Questions:
- General follow up question
  - o *How often do you feel this way about coming to the hackerspace?*
  - o *Can you tell me about a time when you were really excited to come to the hackerspace?*
  - o *Can you tell me about a time when you didn't really want to come, but you felt like you had to so you came anyway?*
  - o *Can you tell me about a time when you did not come to the hackerspace, but then regretted it?*
- If they were excited to come because of something social
  - o *How do you usually feel about seeing [that person/those people]?*
  - o *How do you usually feel about these kinds of social events?*
  - o *Can you tell me about a time when you wanted to avoid a similar social situation?*
- If they were excited to come because of one of their projects
  - o *How do you usually feel about your projects?*
  - o *Can you think about what might have made you more excited about that project than your other projects?*
  - o *Let's talk about how other people might experience the hackerspace. Can you imagine a couple of different people? Describe them for me as people and then talk about how you think they feel about the projects.*
- If they were excited to come because of someone else's project they were going to help with
  - o *How do you usually feel about opportunities to help out other members this way?*
  - o *Can you think of a time when you were not enthusiastic to help another member with their project?*
- If they could not think of a time they were excited to come
  - o *Can you tell me about a time when you avoided coming to the hackerspace?*
- If they were not excited because they didn't want to run into someone specific
  - o *How do you normally feel about running into that person?*
  - o *Was there a specific reason you felt like avoiding this person?*
- If they were not excited because they didn't have anything to work on
  - o *What do you usually do at the hackerspace when you don't have a specific project to work on?*
  - o *How do you get yourself out of this kind of funk?*
- If they were not excited because they thought it would be boring
  - o *How often do you feel this way about the hackerspace?*
  - o *Do you take any measures to solve this problem?*
- If they regretted not coming because they missed someone who ended up being there
  - o *How do you feel about getting to see that person / missing that person?*

- o *Do you get to see that person often?*
- o *What is your relationship with that person like?*
- o *How does that person contribute to your experience at the hackerspace?*
- If they regretted not coming because they found out later that something cool happened
    - o *How often does something like this happen?*
    - o *What do you think would have happened if you had been able to make it?*

Interviews about the "maker" identity
Lead off question :Tell me about how you came to be involved with the hackerspace here. What was your first time like? Tell me all about it as if I had never been.

Covert Categories of Interest:
- What is a maker?
    - o Do you refer to yourself as a maker?
    - o Are there people who call themselves makers who you would not call makers?
    - o Are there people who do not call themselves makers who you think actually are makers?
- What does being a maker *mean* to them?
    - o Is being a maker an important part of their identity?
    - o Do they think about what it would be like to not be a maker?
    - o What would they do if something happened and they had to give up being a maker?
        - ▪ Is this even possible?
- Does being a maker depend on one's skills, or is it more about an attitude or way to approach life?

Possible Follow-up Questions:
- General follow-up questions
    - o *Can you tell me about a situation where you thought someone was a maker but they did not think so? or vice versa?*
    - o *Can you think of a time when you met someone who claimed to be a maker, but you really didn't think they were?*
    - o *Can you tell me about a time when you've had to introduce this hobby to another person?*
- If they describe a type of person they don't think counts as a maker
    - o *Can you go into any more detail why you don't think that person counts as a maker?*
    - o *Describe for me the ideal maker. Who is this person? Give me as many details as you can. Tell me about people involved in Hackerspaces who don't line up with this ideal description.*
    - o *What qualities separate what you do from what they do?*
    - o *What makes a person a maker?* (Only ask this if they don't give you other things to ask about)
- If they can't think of someone they would not call a maker
    - o *Can you imagine a situation where you might disagree with someone else's claim that they are a maker?*
    - o *What might keep someone from being a maker?*
- If they never introduce their hobby to other people
    - o *Do you try to keep your hobby a secret from people?*

- o *Can you imagine explaining your hobby to me for the first time?*
- o *Tell me what happened at the last get together as if there was to be a movie about it.*
- If they exaggerate or lie to others when they introduce their hobby to try to save face
  - o *What do you think the person would think of you if they actually knew [XXX]? (e.g. how many hours you actually spend on this hobby, how little you might actually know about this hobby, etc)*
- If they try to get others excited about their hobbies while explaining them
  - o *What other tactics do you use to try to excite others about your hobby?*
  - o *Can you think of a time when you were explaining your hobby to someone else and they just weren't getting it or just weren't excited like you wanted them to be?*

Appendix B: Hackerspace Design Patterns

I include several of the relevant hackerspace design patterns, as presented on hackerspaces.org. These are often cited in both in-person discussions as well as online in the hackerspaces.org listserv threads as starting points for creating a hackerspace. In Chapters 5, 6, and 7, I critique the language used in these patterns, and demonstrate how they are sometimes used to push an explicit hacker rhetoric that covers up the more nuanced, caring practices that help hacker communities succeed.

Each pattern is divided into "Problem" and "Implementation," and come from a presentation by Jens Ohlig and Lars Weiler titled, "Building a Hackerspace," which was presented in 2007 at the 24th Chaos Communication Congress in Berlin.

The Roommate Anti-Pattern

https://wiki.hackerspaces.org/The_Roommate_Anti-Pattern

> Problem:
>
> *You need a space for meetings and as a lab, to store and work on materials for projects. In order to minimize rent or out of sympathy, you think it's great when someone lives in your space. But somehow it doesn't work, as you cannot use the lab anymore.*
>
> Implementation:
>
> *Guest are fine, but **don't let anyone live there**. Kick them out if necessary.*

The Landlord and Neighborhood Pattern

https://wiki.hackerspaces.org/The_Landlord_and_Neighbourhood_Pattern

> Problem:
>
> *You have found the perfect hackerspace, but the landlord seems to be weird. Also, the neighbours are picky.*
>
> Implementation:
>
> *Choose wisely. A benevolent, but **uninterested landlord** and **cool neighbours** can be the decisive reasons why the hackerspace takes off or not. Not so cool neighbours may call the cops at 2AM. Depending on your projects, this may be a serious problem. As hackers you do not live the majority lifestyle — look for neighbours who are also weird and outside the majority.*

The Flat Surface Pattern

https://wiki.hackerspaces.org/The_Flat_Surface_Pattern

Problem:

Every usable flat surface eventually gets taken over by clutter.

Implementation:

Promote self-responsability: unused stuff is easier to find where it belongs, and no unused stuff belongs to the flat surface. Regularly assign someone to declutter. Alternatively, throw away everything on the flat surface. End of discussion.

The Coziness Pattern

https://wiki.hackerspaces.org/The_Coziness_Pattern

Problem:

All work and no play makes Jack a dull boy. There must be something else than only workstations and electronics.

Implementation:

Bring in couches, sofas, comfortable chairs, tables, ashtrays, ambient light, stereo equipment, a projector, and video game consoles. Bringing in plants didn't work for us.

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Education

May 2016	**Indiana University—Bloomington, IN** Ph.D. Informatics, Human Computer Interaction Design Minor: Inquiry Methodology Dissertation: *Care Ethics and Maker Communities: Care as an Interpretive Lens for HCI Research* Co-chairs: Jeffrey Bardzell and Shaowen Bardzell
May 2012	**Indiana University—Bloomington, IN** M.S. Human Computer Interaction Design
May 2010	**Ball State University—Muncie, IN** B.S. Computer Science Minor: Mathematics

Professional and Teaching Experience

2016	**Adjunct Faculty, Indiana University—Purdue University Indianapolis (IUPUI)** INFO-H564 Prototyping for Interactive Systems
2015	**Lecturer, Indiana University** INFO-I310 Multimedia Arts and Technology
2011—2015	**Graduate Research Assistant, Indiana University** Developed physical prototypes and data visualizations. Conducted interviews, focus groups, and a long-term ethnography. Created, organized, and led design and research workshops. Analyzed and coded qualitative data.
2010—2013	**Associate Instructor, Indiana University** INFO-I494 Informatics Capstone INFO-I542 Foundations of HCI INFO-I590 Advanced Prototyping. Developed curriculum and taught physical computing concepts using Arduino, Intel Perceptual Camera, and Lilypad.
Summer 2011	**Intern of Applied Research, LexisNexis** Developed interactive and dynamic mockups for mobile versions of LexisNexis systems. Developed information visualization techniques to be used in analyzing user experience reports. Translated user experience reports into interaction design implications.
2010	**Teaching Assistant, Ball State University** CS345 Human-Computer Interfaces

Summer 2009 **Research Assistant, Ball State University**
Developed a curriculum visualization software application for use in higher education.

Summer 2008 **Software Developer, Institute for Digital Entertainment and Education**
Developed commercial software for multi-media, interactive presentations and demonstrations.

Journal Publications

Toombs, A., Gross, S., Bardzell, S., Bardzell, J. (accepted). From Empathy to Care: A Feminist Care Ethics Perspective on Long-Term Researcher-Subject Relations. *Interacting with Computers:* Special Issue "Ethics Matter(s)."

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Conference Proceedings

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Book Chapters

Toombs, A., Bardzell, S., and Bardzell, J. (2014). Becoming Makers: Hackerspace Member Habits, Values, and Identities. In J. Söderberg & Maxigas (Eds.) *Book of Peer Production: Special FSCONS Edition* (pp. 36-45). Aarhus, DK: NSU Press. [Invited from Special Issue of Journal of Peer Production]

Invited Talks

2013, October 8. Guest Lecturer, INFO-I310: Media, Arts, and Technology. *Expert Amateur Visual Practices in WoW Machinima*. Indiana University, Bloomington, IN.

2013, October 7, 14, & 21. Guest Lecturer, INFO-I590: Advanced Prototyping. *Interactive Prototyping with Sensors*. Indiana University, Bloomington, IN.

2013, October 3. Invited Speaker, IU Makes Lecture Series. *Self-Made Tools in Hackerspaces*. Bloomington, IN.

Invited Research Institute

2015. *Summer Institute*, Consortium for the Science of Sociotechnical Systems (CSST).

Awards

2015. 2 x Best Paper Award Nominations, ACM SIGCHI Conference on Human Factors in Computing Systems.

2014. Best Paper Award Nomination, ACM SIGCHI Conference on Human Factors in Computing Systems.

Professional Service

2013-present. Reviewer for ACM SIGCHI: CHI, DIS, CSCW, DIS Pictorials, and alt.chi.

2014-2016. Student Volunteer for ACM SIGCHI conference.

2014. Volunteer for Making Subjects Conference. Indiana University Bloomington. Technical Volunteer for Clyde, Arduino, XBee Integration session.

2013. Reviewer for Journal of Peer Production.

Community Service

2012-2014. Bloominglabs. Making, hacking, and tinkering workshops; event organization.

Media Coverage

2014, January 18. Featured post on Instructables. http://www.instructables.com/id/The-Pee-Timer-Connecting-the-Arduino-the-Intel-Per/

Professional Affiliations

Association for Computing Machinery (ACM)