

A Feminist Utopian Perspective on the Practice and Promise of Making

Johanna Okerlund
University of North Carolina at
Charlotte
Charlotte, USA
jokerlun@uncc.edu

David Wilson
University of North Carolina at
Charlotte
Charlotte, USA
davils@uncc.edu

Celine Latulipe
University of Manitoba
Winnipeg, MB, Canada
celine.latulipe@umanitoba.ca

ABSTRACT

While makerspaces are often discussed in terms of a utopian vision of democratization and empowerment, many have shown how these narratives are problematic. There remains optimism for the future of makerspaces, but there is a gap in knowledge of how to articulate their promise and how to pursue it. We present a reflexive and critical reflection of our efforts as leaders of a university makerspace to articulate a vision, as well as our experience running a maker fashion show that aimed to address some specific critiques. We analyze interviews of participants from the fashion show using feminist utopianism as a lens to help us understand an alternate utopian narrative for making. Our contributions include insights about how a particular making context embodies feminist utopianism, insights about the applicability of feminist utopianism to makerspace research and visioning efforts, and a discussion about how our results can guide makerspace leaders and HCI researchers.

CCS CONCEPTS

- Human-centered computing → Human computer interaction (HCI); HCI theory, concepts and models.

KEYWORDS

Makerspace, critical, feminist utopia

ACM Reference Format:

Johanna Okerlund, David Wilson, and Celine Latulipe. 2021. A Feminist Utopian Perspective on the Practice and Promise of Making. In *CHI Conference on Human Factors in Computing Systems (CHI '21), May 8–13, 2021, Yokohama, Japan*. ACM, New York, NY, USA, 16 pages. <https://doi.org/10.1145/3411764.3445126>

1 INTRODUCTION

The making phenomenon, which encompasses the recent wave of emphasis on Makerspaces, Hackerspaces, and digital fabrication technology, has generated a lot of excitement in various communities. Champions of the phenomenon cite a wide set of possible benefits to individuals and society at large including access to educational experiences in STEM, fostering entrepreneurship, promoting

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

CHI '21, May 8–13, 2021, Yokohama, Japan

© 2021 Association for Computing Machinery.

ACM ISBN 978-1-4503-8096-6/21/05...\$15.00

<https://doi.org/10.1145/3411764.3445126>

a personal sense of agency, providing a pathway to a more sustainable circular economy, and, more generally, democratization and empowerment [13, 21, 25, 26, 38].

Lindtner et al. point out how “Making is often articulated in utopian terms” by both practitioners and HCI researchers, but there is a simultaneous “skepticism towards some of these projects, suggesting that they are unrealistic or even naive” [33]. Many researchers have critiqued making for falling short of its promises or how the assumptions are flawed to begin with [2, 3, 33, 44]. Critiques include how makerspaces tend to be exclusive, even when they explicitly emphasize inclusivity and how there is an inherent fixation on the technology to the point that it inhibits true societal change [4, 15, 33, 49]. Despite these critiques, HCI researchers and maker practitioners are optimistic for the future of the making phenomenon and continue to pursue agendas that support making. However, there remains a significant gap in our understanding of how to articulate the promise of making in a better way and how to pursue it, all while maintaining the unique features that have made the making phenomenon popular so far. In other words, there is work to be done to “reconstitute the utopian vision of making” [33].

We have experienced this gap in knowledge firsthand as we have worked on setting up and running a university makerspace for the past 4.5 years. We were aware of the general critiques and potential pitfalls of making and our observations told us that we had not done enough to address these challenges in our own space. We had hoped that emerging use cases and community efforts would help us collectively formulate the mission of our makerspace in the context of the university and of society at large, but we found this approach to be insufficient. We had also hoped to draw upon examples reported in the HCI literature. While there are some inspiring accounts of different narratives around making such as feminist hacking, critical making, and the specific promises making brings to communities around the world [20, 23, 36], these works did not provide the structured perspective we needed to guide our own makerspace forward in a meaningful way. We were left with the following question, which is the central research question of this paper: *How do we frame the practice and promise of making in a way that will guide our actions toward better fulfillment of the promise?*

In addition to running the makerspace, we collaborated with others on campus to create and run Statement Making, a three-time annual digital fabrication fashion show. The fashion show was loosely aimed at addressing some of the critiques and observations we had made about the local maker culture: academic departments were siloed off from each other, there was little collaboration amongst

the students, and we found little evidence of students branching out to learn or do new things. Statement Making became a popular and widely-celebrated event that attracted diverse participants, was meaningful for those who were part of it and those who watched it, and in some ways took on a life of its own. As HCI researchers and as makerspace leaders, we wondered if there were any aspects of Statement Making that could be adopted for use in the makerspace or if an understanding of Statement Making could help us frame the practice and promise of making in a way that would help us guide our makerspace. This paper describes a study that uses principles of feminist utopia as a lens to provide perspective on what Statement Making may offer in the way of framing the practice and promise of making. We use these insights to argue that feminist utopianism is relevant and helpful for makerspace leaders, which is the primary contribution of this paper. Additional contributions include insights about what making practices, mindsets, and contexts that embody principles of feminist utopia may look like and suggestions for makerspace leaders and HCI researchers on how the idea of a feminist utopia can guide making and design endeavors.

We also frame this paper in the context of some broader societal challenges. The making phenomenon represents a new relationship between humans and technology: one that embodies a shift in the control of technological production and increased access for the general population to activities that were once only in the hands of designers and researchers. Every technology that has been “democratized” in this way brings great promise: The Internet promised everyone a voice, social media promised that everyone would feel connected all the time, entertainment platforms promised a totally customized and personalized content-viewing experience. However, all these democratized technologies have eventually brought about unintended consequences: we no longer have a common perception of truth, we have become addicted to “likes”, conspiracy theories run rampant, and healthy discourse between differing viewpoints has broken down. The broad question here is similar to the question we faced as makerspace leaders: How should technologists frame the promise of technology in a way that will guide their actions toward better fulfillment of that promise? By facing these questions in the context of our local makerspace, we aim to shed light on more general ways for HCI researchers and technologists who are enthused by democratization to think about their relationship to the promises and the process by which they may unfold.

2 RELATED WORK

2.1 HCI Research on Making

Throughout this paper, we will refer to the rise of Makerspaces, Fab Labs, and the broader wave of engagement in making and digital fabrication as the “making phenomenon”, focusing on this trend from a Western, US-based perspective. While we refer to “making” or “makers” as a homogeneous group, it is important to note that there can be substantial variation in the range of practices, values, and goals [6]. For example, many have argued that “making” should also include hacking, repair, craft, reappropriation, etc. for full inclusion. Cultural context also makes a difference. For example, Lindtner et al. and Bardzell et al. have conducted long-term ethnographic studies of makers in Taiwan and China and discuss how the supposed global sentiment of making as democratizing is

very western and making brings a very different promise to those different regions [9, 33, 36].

As a frame of reference, then, we highlight some research that studies makers, communities, and contexts in the US to illustrate the types of things researchers are noticing about particular groups of makers. Some have looked into use cases of these spaces, finding a wide range of practices such as entrepreneurship [1, 26, 35], IKEA hacking [45], DIY assistive technologies for others [27], and use as a social space [1, 14]. Many makers are drawn by the desire to help people or “do good” and participate in activities such as 3D printing prosthetics for children [42]. Kuznetsov et al. did one of the largest surveys of makers, studying participants in online sharing communities, to understand their practices, motivations, and values [29]. They found, for example, that some of the top motivations for contributing to projects online included self-expression, learning new skills, personalizing things, and solving problems [29].

2.2 Critiques of Making

Some of the main critiques of making revolve around (1) how spaces fail to live up to their claimed values of inclusion, (2) technosolutionist ideas that the technology associated with a makerspace itself will solve problems, and (3) how narratives of making tend to be based on Western-centric ideas of democracy [6]. While a common value and promise of making is being “radically inclusive”, some researchers and community members have pointed out that many do not live up to that promise [1]. It is not enough to simply claim to be open to anyone and expect democracy to emerge [1]. Gershenson et al. discuss the promise of Fab Labs to transform society, but note that for the technology to achieve that promise, there is much societal infrastructure that must be put in place [22]. They point out that in past technological revolutions in communication and computation, the technology makes leaps and society struggles to catch up, meaning that inevitably, the great promise falls short. Technology will not drive social change, but it can be leveraged; technology and society should be envisioned and shaped together. Lindtner et al. similarly discuss technosolutionism in making, using examples of individuals who have been empowered through making, though it was more than just the tools that instigated that empowerment [33].

Bardzell et al. point out that despite these critiques and others in the HCI literature on making, there is still optimism on top of those critiques [6]. The optimism is not that making will solve things for us, but that we can leverage making to achieve the vision. To do this, they suggest that HCI pursues a research agenda around making that includes considering social justice more directly, alternate making ecologies, and more precise definitions of words that are used as rhetoric. Our work is similarly grounded in the critiques that Bardzell et al. present and we pursue some of the themes they mention such as narratives, inclusion, and alternate maker ecologies.

2.3 HCI Agendas for Making

HCI has taken an increasing interest in makers, Makerspaces, and Fab Labs in recent years [6, 26, 29]. In part, this is because making is an interesting domain area with potential for the design of rich, novel user-technology interactions and experiences. There

are, however, deeper connections between HCI and making, such as how HCI itself involves a lot of making, and researchers have posited that HCI might adopt some of the maker practices and values towards interesting and useful innovations [29, 35].

HCI researchers have also pointed out how there are aspects of HCI reflected in the maker phenomenon. Some of HCI's overarching goals are to democratize technology and empower people to use it and interestingly, democratization and empowerment are also cited promises of the making phenomenon [6, 44]. We might also recognize many of the artifacts coming out of Makerspaces as devices we would see in CHI or UIST conference papers (e.g., Internet of Things (IoT) devices [35]). This means that makers are different from the typical users that HCI studies because the already empowered makers are able to make things for themselves [44]. In some ways making represents a step towards the vision of an empowered society that engages in democratized technological practice that HCI imagines creating [6]. So, another reason to study makers is to understand how they operate and get more people to be like them [44]. Doing so would involve shifting HCI endeavors from designing end-use artifacts to designing reappropriatable systems, materials, and tools to spread maker empowerment [44].

Within this agenda of democratization and empowerment through making, however, there seem to be blind spots in HCI research. Several researchers have called for a more robust and holistic look at what HCI's commitment to democratization and empowerment through making really means or looks like [6, 44]. For example, Roedl et al. point out how some of the discursive rules that legitimize making as an object of study within HCI are “based on the promise that this maker will do social good” [44]. Given that making has already been established for study within HCI, Roedl et al. suggest that it is time for HCI researchers to ask whether the maker is actually able to do social good, how we know they have done more good than harm, and if there are ways that would be appropriate to ensure that there is more good than harm [44]. Bardzell et al. suggest some new agendas for HCI relative to making such as exploring alternate versions of what a makerspace could be, a more serious commitment to social justice, and developing different narratives around making [6]. HCI researchers have studied and discussed making contexts and endeavors that have had more of a social justice orientation such as feminist hacking, critical making, and the specific promises making brings to citizens of countries around the world [20, 23, 36]. However, the implications or guidance these papers conclude with did not necessarily answer our questions as maker leaders of how to guide our makerspace, short of replicating the endeavor as a whole. And there are fewer examples of HCI researchers taking social justice as the primary goal of design interventions in the making phenomenon. It is also difficult for HCI to pursue a fully social justice-oriented design intervention in the making phenomenon because doing so would require HCI taking a more political look at the power dynamics at play and ultimately intervening in ways that are not typical in HCI [44].

This sets the stage for our work – we know that making has not lived up to the broad promises of democratization and empowerment, though HCI researchers continue to use that framing as a legitimizing factor in HCI discourse. We contribute to these agendas by investigating an alternate framing that is still in line with

HCI's original agendas, but that addresses some critiques and is helpful for maker leaders in their visioning efforts. In Bardzell et al.'s extensive review paper on HCI research on making, they cluster the agendas into a few categories: “The first is a utopian agenda of making, which emphasizes individual empowerment, learning, and economic growth. The second is a more critical agenda, seeking to show how, when, where, and why making fails to deliver on some of its own promises. And finally there is an emerging agenda, one with the benefit now of a decade of intense research and investment, that seeks to pursue utopian agendas but made wiser by the additional experience and the outcomes of the more critical research” [6]. Our paper fits into the last category.

3 METHODOLOGY

We draw upon several methodologies. Overall, our research follows a similar trajectory as Lindtner et al., whose research agenda was also working towards a new articulation of the utopian vision of making [33]. Lindtner et al.'s work consists of two components: a critique of the present to reveal challenges and opportunities as well as an anticipatory design approach that involves projecting what the future could look like through glimmers that are evident in fragments of the present. In this paper, when we discuss Statement Making, we position it in relation to critiques of the present local makerspace context. We look for glimmers of a new way to frame the practice and promise of making within Statement Making, using fragments of the present to consider what the future could entail. We also draw upon reflexive ethnography [43] to articulate the motivation behind this research, specifically using our experience as makerspace leaders to argue why an updated way to frame the practice and promise for making is necessary and showing how we find the ideas of feminist utopianism to be useful in guiding our own actions.

Since our primary contribution is an argument for the relevance of a particular concept to the making phenomenon, our theoretical development adopts a Humanistic HCI perspective, patterned as an essay that draws upon literature to argue a point [5]. To further support our thesis about the relevance of principles of feminist utopia to the making phenomenon, we present an empirical study of a maker context that uses principles of feminist utopia as a lens to understand how a feminist utopian context for making might manifest to inform concrete suggestions for maker leaders. The empirical study uses qualitative thematic coding methods to find evidence of characteristics of feminist utopianism in a set of participant interviews.

The need for multiple methodologies is due, in part to, as Lindtner et al. point out, how “a methodological blind spot has made it hard for HCI to pursue technical and sociopolitical agendas simultaneously: common methodological stances tend to prioritize either the possibilities of technical innovations or careful sociopolitical critique—but not both equally and at the same time” [33]. To move forward with our work as makerspace leaders and HCI researchers, we have to simultaneously continue to deepen our understanding of critiques of the present, live with some of the imperfections, propose and act on something new, and continually critique the new reality that is unfolding. HCI's traditional definitions of “progress” do not adequately capture what progress feels like to us as we are

embedded in this project. We encourage the reader to consider the following definition of progress in the context of our work: a step towards a meaningful alternative to the status quo in the making phenomenon that is theoretically grounded and empirically supported and that sets the stage for systemic pathways for inclusion, empathy, and human flourishing to emerge in a way that is participatory, but also committed to certain values.

Our methodological approach also seeks to address what Dourish refers to as the legitimacy trap — a way of framing a narrative of progress that gets in the way of truly pursuing the very thing that was promised [18]. An example of a legitimacy trap in HCI is how early HCI used the concepts of effectiveness and efficiency to argue to tech companies why HCI was necessary. This argument allowed companies to see why HCI was important and allowed HCI to come in and do the work they felt was necessary in the interest of the humans. However, this framing gets in the way of some of the topics HCI researchers are realizing are necessary to pursue, some of which lie outside of the interests of the tech companies, for example human dignity and flourishing as goals for design. HCI's early way of legitimizing itself in terms of effectiveness and efficiency makes it hard to pursue these other goals [18]. We suggest that there is a similar legitimacy trap with making. One of the things that has legitimized the study of making within HCI research is a particular narrative of progress around making: the making phenomenon democratizes access to technological production and empowers participation. Because HCI's own goals include democratization and empowerment, an exciting new way to spread that goal is through studying makers and spreading maker empowerment- i.e. by creating tools and experiences to turn more people into makers [6]. However, framing makers as empowered makes it harder for HCI researchers to justify research that suggests new ways for the making phenomenon to be, since this requires acknowledging that makers are not as empowered as it originally seemed. This makes it difficult for HCI researchers to justify any intervention in the making phenomenon and why we call upon our positionality as makerspace leaders to draw attention to opportunities for HCI research (and eventually design intervention) we have uncovered.

4 EXPERIENCE AS MAKERSPACE LEADERS

In this section, we describe our experience as makerspace leaders to show how we came to need a way to frame the practice and promise of making to guide our actions. The authors on this paper were all involved with the starting, management, and guidance of a university makerspace. We all had experiences with different types of making, but none of us had much experience with the making phenomenon directly. Our makerspace is located in the College of Computing and Informatics at the University of North Carolina (UNC) at Charlotte, a university in the southeast region of the USA with about 29,000 undergraduate students and 6,000 graduate students. At the time we created the makerspace, there were no other open-access makerspaces or fab labs on campus, though that changed in later years as the Arts lab became more external-facing and as the library opened a makerspace.

We started by immersing ourselves in online maker communities to understand what the making phenomenon was all about, acquiring tools and materials, and developing policies and training

materials. While each makerspace has a slightly different equipment profile, we decided on a fairly standard set of 3D printers, laser cutter, sewing and digital embroidery machines, desktop CNC router, e-textiles, and microcontroller electronics. When the space was open, we had student staff members present to oversee activity in the space. Anyone from the UNC community was welcome to get trained on the machines and make anything they would like.

Our initial goal was to create an open-ended space in the College of Computing and Informatics of our university that was open to students, faculty, and staff from all departments for creativity, collaboration, informal learning, and community. We saw opportunities for the space to foster informal exploration of concepts introduced in formal education such as tangible interaction design or the Internet of Things (IoT). We figured many of the use cases would emerge and it would become clear over time what particular purpose the space would serve in the university context and society at large. We saw our role as makerspace leaders to be understanding that emerging purpose and supporting and fostering those types of endeavors. In other words, we imagined we would frame the practice and promise of making based on what activities we saw emerging, and use that understanding to guide our actions as leaders of the space.

4.1 Searching for the Practice and Promise of Making

As the space became more established, it did not become clearer what purpose the space could serve within the university or society at large. A collective purpose connected to the promises of making did not seem to coalesce. Many of the emerging use cases of our makerspace were one-off personal projects such as a gift or a laptop stand, download-and-prints, and students using the space as a homework hangout spot. There was nothing wrong with any of these endeavors, but they did not shed light on the potential for the space or shed light on what we, as makerspace leaders, should do to develop the space. We also observed that only a narrow population of students had made their way into the space based on demographics and discipline, indicating that our space was privy to some of the barriers to participation that were commonly discussed in the literature. If we were to continue to let the space operate in an open-ended free-for-all where we open the doors and let anyone do whatever they would like, these trends would be unlikely to change.

We structured a number of interventions to encourage engagement and to help people realize the possibilities. For example, we ran workshops where participants could learn skills such as 3D modeling or sewable electronics, complete small projects such as an embroidered bag, or get an introduction to a machine such as the CNC router. We were approached by schools, camps, and other events, so we developed an educational component to bring making to others and we invited makerspace participants to help lead those activities. The student staff working in the space were encouraged to express excitement in projects, and facilitate connections or collaborations as appropriate. One-on-one equipment training sessions afforded the opportunity for staff to tailor their introductions to new makerspace participants based on their interests.

A number of community-led endeavors did emerge that we supported and tried to use as guideposts in our own framing of the space and how we communicated it to others. The most notable was a student-led organization centered around 3D printing prosthetic devices for children with limb differences. This organization was highly active, brought a new population into the space, and grounded a way for us to frame the makerspace in terms of “enabling student groups that are helping the broader community”. However, we were unsure of how to further operationalize that idea or develop the space towards fulfilling that kind of promise.

In a different approach, we turned to the HCI literature on making, where it is common to frame making as a mechanism of democratizing technology production and empowering individuals and communities [6]. One of the examples of this promise cited in the HCI literature is how makerspaces enable anyone to create IoT devices for themselves, which is typically a task that is reserved for researchers or designers [35]. Makerspaces enable individuals to create these customized devices for themselves rather than needing HCI researchers or designers to design for them. This example from the literature provided an answer to our main question about the practice and promise of making. Specifically, this suggests that the promise of making is the democratization of the ability to create personalized devices. An example of this promise in practice is makers creating customized IoT devices for themselves. For us as makerspace leaders, this meant our immediate actions should encourage and support this particular use case. This was a satisfying answer to the question about the practice and promise of making at the time, but as we describe next, left us with new questions about how we should move forward with guiding the makerspace to better fulfill that promise.

We had not yet observed anyone making IoT devices in our space, but students we talked to seemed excited about it. We had an abundance of the required tools and materials, but we thought we might need some workshops, tutorials, or examples to help people realize what is possible. As we were conceptualizing what these workshops might look like, we turned to HCI literature to understand what the possibilities were and to see if there were some big ideas we could leverage to inspire the students. Also, since HCI literature emphasizes the shift in who creates IoT devices from HCI researchers and designers to makers [35], then understanding the scope of conversations in HCI around the topic seemed like a reasonable place to start. Unsurprisingly, the HCI literature on IoT contained a mixture of technological innovations, novel interactions, and critical research pointing out some of the concerns or nuances to be aware of when creating always-on devices for the home. For example, a 2016 DIS workshop proposal pointed out that despite the promise of IoT to promote holistic benefits to humans, there are many dangers and pitfalls and aimed to explore how we can “challenge, preserve or promote human values” in IoT [48]. Privacy and security are known concerns with IoT and are difficult for researchers to tackle [50]. Lingel argues that the way IoT technologies are typically conceived is unconfigurable and rigid - and suggests drawing on insights from how craftspeople configure their homes to think of IoT in a more configurable, flexible, and responsive way [37]. Other important considerations for IoT include specific requirements of devices for survivors of home abuse and concerns regarding privacy breaches surrounding intimate devices [30, 51]. As makerspace leaders who

share these values and concerns of HCI researchers, we were left wondering how we should introduce IoT to the makerspace.

In other words, if we were going to work towards making’s promise of democratization in part by encouraging makerspace participants to explore the possibilities of IoT devices, we also felt a responsibility to ensure they fully consider the human experiences that these devices knowingly or unknowingly engender. However, not only was it unclear how to do that (would our guided workshops follow a human-centered design process?), it was also unclear what that meant for our role as makerspace leaders (to what extent would we be overstepping our bounds?). To fully take on this challenge, we would have to change from being peripheral facilitators of a free-for-all space to something more deliberate and involved. While taking on this new role is in line with Bardzell et al.’s call to the HCI maker research community to “prototype alternate maker ecologies” and make a more serious commitment to social progress [6], we encountered a number of tensions and power dynamics that we were not sure how to reconcile. For example, if we as makerspace leaders were to commit to any one definition of social progress, that would inevitably de-value certain endeavors in the space. However, with no commitment to social progress, the makerspace is already de-valuing endeavors that are invisible within the current value system. A feminist stance paradoxically not only calls for an intervention to advocate for those who could be participants in making phenomenon and for those impacted by the things makers make, but also suggests that those in power should not impose a singular viewpoint on others. We were conscious of our position of power as leaders of the makerspace, but we did want to move the space forward. To do so, we needed to answer the following questions:

- If we do not know what development or progress looks like, how do we commit to development? How do we pursue a better future when we do not know what the future looks like? To what extent should we drive the space towards a vision, and to what extent should the space drive its own meaning or purpose? How do we allow this balance to happen?
- If we do have an idea of what development or progress look like, how do we balance that agenda with the open-ended, open-door, free-for-all spirit of our makerspace and of the making phenomenon more broadly?
- If democratization is the promise of making, what does that mean and what does that look like? If we support the democratization of a particular technology or activity from the few to the many, how do we know the many will be responsible? What should we be mindful of during this democratizing endeavor? Again, how do we balance our own values, concerns, or agendas relative to democratization with other values, concerns, or agendas?

We needed to answer these questions to answer our main question about how to frame the practice and promise of making in a way that would better guide our actions as maker leaders towards that promise. We next turned to literature on democratization and participation to see how others have reconciled the tensions discussed above or if anyone could offer guidance for leaders who align their efforts with democratization. In doing so, we came across the idea of feminist utopianism, which we summarize in the next section,

discussing how it answers these questions we faced as makerspace leaders.

5 FEMINIST UTOPIANISM

In this section, we summarize the concept of feminist utopianism, literature in HCI on feminist utopianism, and make the argument that feminist utopianism is a good fit for framing the promise and practice of the making phenomenon in a way that is helpful for makerspace leaders to guide their actions towards the fulfillment of the promise.

5.1 Definition

Typical utopian thinking has been criticized as being a “fantasy” that lacks any connection to the present, as valuing “totalizing” and inflexible ideas that could very easily go horribly wrong, and as not allowing the public to participate in ideating the vision [8]. Feminist utopianism is an alternative discussed by philosophers including Johnson, Benhabib, McKenna, and Levitas that addresses some of these critiques [8, 10, 28, 31, 39]. The defining feature of feminist utopia is a process model of utopia where multiple possible futures are emerging as the result of lived experiences, rather than an end state model that involves an individual thinking about an abstract representation of a single static possible future [39]. In the process model, the utopia is not the end result, but rather the way in which the future emerges, or the path along which multiple possible futures are in progress. The future is possible, but is “unrepresentable”, meaning it is not possible to describe it ahead of time [8].

Bardzell introduces feminist utopianism to the HCI community, presenting a strong argument for its merits, particularly as a fellow traveler to Participatory Design (PD) [8]. Some of the shortcomings of Participatory Design are the difficulties in scaling beyond local experiments and the fact that PD endeavors still involve a designer configuring the participation. Feminist utopianism addresses both of these by offering a perspective on how similar ideas might manifest at a community-wide or society-wide level [8]. Hope et al. discuss how their iterative process of creating spaces to re-imagine breastfeeding-related products, services, and policies relates to both the ideas of feminist utopianism and Participatory Design [24]. We expand on Bardzell’s and Hope et al.’s work by exploring feminist utopianism in the specific context of leading a makerspace to shed further light on how it can inform HCI research and design.

We use the following six criteria throughout the paper to capture the main aspects of feminist utopianism. The first five criteria were taken directly from McKenna, who presents them as a way to understand a context in terms of the process model of a feminist utopia [39]. Contexts that embody these criteria are in line with the feminist utopian ideas that value a participatory emergent pursuit of better undefined futures rather than abstract totalizing narratives that are removed from the current reality. McKenna’s criteria are built on Dewey’s ideas of community and democracy, which are also in line with the process-model [16, 17, 39]. We added the sixth criteria ourselves to capture the utopian aspect of feminist utopianism, rather than just the process-model aspect.

All Participate Freely: Promote free and open participation by all people in the society

Making Informed Choices: Lead people to recognize the limits and possibilities of any particular situation and propose realistic choices for action.

Flexible Ideas: Encourage people to avoid making dogmatic claims and to remain open to change.

Flexible Futures: Encourage people not to focus on achieving some end, but on developing abilities for multiple ends to be realistically possible

Interconnectedness: Open up possibilities and promote an awareness of our interconnectedness and diversity.

Pursue Better: Actively pursue radically better versions of the future.

5.2 Relevance to Making

This concept of feminist utopianism and these criteria in particular satisfied some of the questions we faced as makerspace leaders presented in Section 4, even before we used the concepts in a formal way. Feminist utopianism answers them by allowing maker leaders to shift our thinking away from the end goals towards particular characteristics of the path that is emerging. It relieves us of the impossible task of defining the future that making will bring or articulating the promise of making, and in fact says it is a good thing we do not have an answer to that question. Feminist utopianism naturally embeds a balance between open-ended, individual-driven endeavors and forward-driving efforts, as long as there is flexibility and understanding between. Open-ended, individual-driven endeavors are in line with the free and open participation criteria and are necessary for community members to make informed choices and fully recognize the interconnectedness and diversity of others. Feminist utopianism relaxes the requirement for makerspace leaders to lead the makerspace towards any particular vision, since different visions will emerge over time. The leaders do, however, have the responsibility to commit to the value of pursuing radically better versions of the future, even if the specifics are not clear yet. The feminist utopia criteria resonated with our early ideas that we would define the purpose of the makerspace based on what we saw emerging, but helped us think more specifically about the conditions under which this would happen. If these criteria were evident in our makerspace, perhaps the context would be primed for a better-defined and fulfillable promise to emerge.

The feminist utopia criteria also relate to, and perhaps subsume, the concepts of democratization and empowerment that are commonly associated with making or are used in HCI research. For example, Tanenbaum et al. suggest a definition of democratized technological practice that encompasses and balances pleasure, utility, and expression [47]. They argue that it is not sufficient to support only one of these aspects, democratization is only present when all three are present. This is in line with the “all participate freely” criteria. Schneider et al. present a framework for different ways the concept of “empowerment” is used in HCI research [46]. One of those ways involves the psychological component of knowing what options are available, as well as feeling the agency to be able to pursue them. This is in line with the feminist utopia criteria of “making informed choices”, which involves knowing the limits and possibilities of a given situation. Roedl et al. argue that there are two ways to talk about maker empowerment: makers as having

access to tools and makers as being socially progressive [44]. Roedl et al. argue that the socially progressive aspect of makers has been used as a framing or legitimizing mechanism in HCI research on making, but has not been given primary consideration as an issue of concern or pursuit. Feminist utopianism brings social progress back to the forefront, while continuing to value the material empowerment aspect that Roedl et al. claim is more easily incorporated in HCI research agendas. These points show that while feminist utopianism has not been widely associated with the making phenomenon in HCI research, it is in line with values and ideas that have already discussed.

To further understand how feminist utopianism relates to making, we conducted an interview study with participants who participated in Statement Making, a digital fabrication fashion show, detailed in the following sections.

6 STATEMENT MAKING FASHION SHOW

Statement Making was a digital fabrication fashion show co-directed for three consecutive years (Spring 2017, 2018, 2019) at UNC Charlotte by one of the authors on this paper and a recent graduate who managed the Fab Lab in the Arts department. Statement Making aimed to address some of the critiques we observed of the local maker culture in and around the spaces we were creating: while there were makerspaces in different departments, they felt siloed off from each other; participation in each space did not seem to be varied; there were not many students collaborating; and overall it felt like there was unfulfilled potential for the role that these spaces could play in the fabric of the university or the broader community. Together, we decided to host a makerspace-related event to encourage participation and collaboration, and decided a fashion show would make sense because it affords the opportunity to combine a range of technological, artistic, and personal interests.

Each year, the prompt for participation in Statement Making was to “Make a Statement” in the form of a wearable garment and showcase it at a public runway event. For months leading up to each annual event, there were workshops on different fabrication techniques for textiles to encourage exploration and provide opportunities for participants to meet each other. Participants could apply for small grants to cover the cost of supplies. The directors encouraged digital fabrication, but accepted anything that was made with purpose and intention.

The focus and goals of the directors evolved over time as we reflected on what the event meant and what it could mean. Initially, the public language around the event consisted of “Statement Making: A Digital Fabrication Fashion Show” and the prompt to “Make a Statement”. The show was a platform for individuals and groups to make a statement, but if the directors had a statement themselves, it was not explicitly expressed. In the third iteration of the show, a pamphlet laid out what the directors were hoping to achieve by creating this open-ended platform. Overall, Statement Making was about prompting individuals and groups to take control at a variety of levels: over the tools and machines around them, over something meaningful in the world, over the confines of mass-produced technology and consumables, etc. Sustainability was a theme emphasized by the directors, since even though there was potentially waste as part of the making process, overall the

practice of making has the potential to be part of a more sustainable circular economy [22].

During the second year of the event, the directors received a grant to build a 64 foot stage that would not only be the platform for the event, but would be a semester-long project for a Sculpture Installation class in the Arts department. A digital fabrication student organization led the construction of the stage and the sculpture class created panels covered in e-waste from the university in the shape of mountains of landfill.

We chose Statement Making as an object of study because it was a well-received making event on campus. It took on a life of its own in ways that we did not expect as we conceptualized it, and it was really meaningful to the participants. Compared to the makerspace that we were running, there was much more interdisciplinary collaboration, more diverse participation, and a different vibe from the makerspace. It seemed like there was something interesting or different going on, so we conducted a study to look for ways Statement Making could shed light on new ways for us as makerspace leaders to frame the practice and promise of making to better guide our actions towards fulfilling that promise.

6.1 Statement Making and Feminism

In prior work, we discussed how maker fashion shows such as Statement Making that incorporate a performative aspect naturally bring feminist HCI design principles into play [7, 41]. Feminist HCI design principles include pluralism, participation, advocacy, and embodiment [7], and the argument is that a performative maker event naturally embodies these principles by bringing bodies, voices, and meaning to the forefront. As makerspace leaders, we had considered whether we might incorporate these principles into the makerspace to improve the experience for individuals, but to do so, we were still faced with the questions we discussed in Section 4 such as how to balance these aspects with the goals or agendas of individual participants, and we also still needed to frame the practice and promise of making in a way that would justify and guide our actions towards that promise.

We therefore embarked on a study to figure out if there was a broader vision for making that Statement Making could help us realize. Bardzell discusses how the feminist HCI design principles are more focused on design in-the-small, while there are other concepts that can help with “democratic design experiments (writ large)” [8]. One of the reasons we wanted to explore this larger-scale look at Statement Making is the same reason that Bardzell suggests considering this scale. Bardzell points out how *petit récits*, which focus on local narratives, typically from marginalized voices, are one approach to calling problematic totalizing visions into question [8]. Some of the shortcomings of this approach are how there is no room for theory or moral universals, and how there are “no mechanisms for us to reject marginal perspectives that should be marginal” [8]. This is a particularly salient concern in the making phenomenon since there are very few mechanisms of control in spaces that have a completely open-door policy. The feminist HCI design principles and our previous work where we draw parallels between these principles and performative maker fashion events [7, 41] fall into this category of design in-the-small: while the emphasis is on understanding the conditions that foster

positive experiences for individuals, this understanding does not shed light on how the broader context could be arranged or how to avoid situations where the conditions are exploited by individuals with other values. These points culminate in Bardzell's question: "The intellectual challenge therefore is to find a way to preserve the moral universals, the utopian impulse, and the drive to design toward replacing the current situation with preferred ones, without relying on a now discredited modernist epistemology. How can we throw out the bathwater without throwing out the baby, too?" [8]. Bardzell suggests feminist utopianism as an answer. We build upon Bardzell's theoretical argument by exploring the specific ways feminist utopianism helps in the context of makerspace leaders framing the practice and promise of making in order to guide their actions.

7 INTERVIEW STUDY

We interviewed participants of Statement Making to understand the event through the lens of feminist utopianism. This study investigates whether feminist utopianism is the answer to the main question of the paper: *How can we frame the practice and promise of making in a way that will guide our actions toward better fulfillment of that promise?*

7.1 Methodology

We conducted a semi-structured interview study, recruiting from participants, supporters, volunteers, and mentors who were involved in any of the past instances of Statement Making. Interviews were conducted in August and September 2019 via video call or in person based on each participant's availability. The interviews were semi-structured, aiming to understand motivations for participating, how participants described their participation, and how they perceived the event as a whole. Question prompts included, "What did you make?", "What was your motivation for participating?", "What is Statement Making?", and "What were some memorable aspects of the experience?". The interviews were audio recorded and transcribed manually by the researchers, omitting names mentioned by participants.

We performed thematic coding on the transcribed interviews. The first pass of analysis used the six feminist utopia criteria introduced above as codes. The fidelity of analysis was by topic, so several sentences could belong to the same unit of analysis or a given response to a question could be broken into several units of analysis based on how many topics were expressed. A quote could have one or several codes assigned to it. The second level of analysis looked separately at each criteria and used an iterative open-coding technique to find emerging themes to characterize the ways each criteria manifested.

7.2 Participants

There were a total of 16 participants (12 designers, 2 faculty mentors, and 2 students who volunteered or helped in other ways). Due to the low number of non-designers who participated in the study, we only include the 12 designers in this analysis. 6 designers were women, 1 was non-binary, 5 were men. Regarding race / ethnicity, participants reported that they were African American (1), Indian (1), mixed (1, black and German), Latino (1), Asian (2), and white

(6). Table 1 summarizes the backgrounds and participation details of our study participants.

7.3 Results

7.3.1 All Participate Freely. Many participants (P2, P4, P5, P7, P13, P14, P16) perceived Statement Making as open and accepting of all sorts of disciplines, types of garments, perspectives, and people. P5 found that Statement Making was "a space that allows people to not only be themselves, but to be the loudest and brightest version of themselves". Even P14, who "was able to ignore" the prompt to "make a statement" for two out of three years of participation and P16, who felt the show was more "political" than anything they were interested in pursuing, did not feel like they were being constrained or forced to approach or think about their participation in a certain way. P16, who was originally invited to view the show by some architecture friends, was expecting a more architectural perspective throughout. When realizing there were many other aspects, they reported, "Initially I thought it was kind of odd. But then after being in it, I kind of liked that idea because it didn't limit me to what I could create. It was just whatever I wanted, I could. So I wasn't limited to having just one type of idea which I really liked." P1 and P16 mentioned how Statement Making provided an opportunity for them to pursue certain making endeavors that they had been thinking about for some time.

There was certainly room for Statement Making to be even more free and open for participation. P4 reported that before they were involved, they perceived the community to be rather "niche". Several participants also suggested that Statement Making could reach an even broader audience (P1, P4, P7, P8, P16).

Other than the designers participating in the event, other forms of participation included collaborations with the model and garments that prompted or sparked conversations with the audience. P13's primary goal was to get people to come talk to them after the show: "I was definitely going for as big of an impact as possible so people would come and ask us and get more insight on that current situation." P1 and P5 talked about how their models participated as collaborators. P1 said that their model "was kind of just there to learn about the process. We were all figuring it out too as we went ... I think we were all just kind of brainstorming together equally". P1 exhibited a sense of camaraderie with their model, figuring the process out together. However, they also describe their model as being "just kind of there", which perhaps indicates that the model's participation was not as full as possible.

There were also several examples of participation beyond Statement Making that were prompted or discussed. P5 commented on how their model now seems generally more confident and willing to "talk about things that are important to her". P4 recognized an internal shift that made them feel more aligned with the identity of creator, rather than consumer of technology. P13's garment centered around the topic of immigration. Rather than simply aiming to educate the audience, P13 interviewed acquaintances who had been impacted to understand their stories and perspective. P12 reported that Statement Making allowed them to participate more deeply with computing than they typically had in their classes.

The main takeaways regarding participation are that designers felt unconstrained in what they were able to contribute and the

Table 1: Study participants who designed pieces for the show. * participated through a digital fabrication Art class. ** participated in a class focused on exploring computation in clothing taught by one of the authors on this paper * participated in a class focused on designing to provoke or critique led by a different author on this paper**

	Major	# Times Participated	Part of a Team?	Design(s)
P1	Art	2	Yes	Fictional science fiction character; costume with functioning prosthetic arm
P2	None, identifies as Designer	1	No	Light-up jacket that responds to music
P4 ***	Computing	1	Yes	Government-controlled headpiece from alternate future that lights up based on wearer's creative contribution
P5	Computing	1	Yes	Costume based on model's identity and cultural heritage
P6 **	Computing	1	Yes	Pair of shirts for remote communicate through touch and haptic feedback
P7	Architecture	2	Yes	Cosplay characters from Star Wars and Zelda
P8 *	Art	1	Yes	Poncho with message about water waste in textile industry
P12 ***	Computing	1	Yes	Hat and glasses from alternate future based on social media over-use
P13	Computing	1	No	Jacket with painted message about immigration-related injustices
P14	Computing	3	Yes	Dress that lights up when lightning strikes the state; color changing light-up shirt; shirt that changes color based on emotion of someone standing in front of the wearer
P15 ***	Computing	1	Yes	Glove and shirt that display an incriminating message when phone is over-used
P16	Architecture	1	No	Parametric design-generated pattern on dress

event prompted some of them to do things they had been thinking about. The designers were not the only ones who benefited from free and open participation; there was meaningful participation amongst the models, the audience, and other people in the designers' lives, all of which was initiated by the designers themselves. While there is room for Statement Making to grow in terms of broadening participation, there is evidence that it is ripe with opportunity for the depth and breadth of participation that feminist utopianism calls for.

7.3.2 Making Informed Choices. Several participants discussed factors that they considered as they made choices relative to the specific garment they were creating for the show. P1 discussed how aspects of the model's personality and preferences were the basis of the design: "when we were initially designing or coming up with the general look of what it was going to be, she was involved in that. Cause you know I didn't want to like go crazy and do something she had no interest in or didn't identify with at all because we wanted it to be something she could feel cool or confident wearing". P2 and P12 took into account what it would be like to wear the piece. P2, in particular, took an experimental approach in fitting the technology to the body: "... I love getting through that process, finding out what works, what doesn't. For instance, the waistline ... it's very non local, it doesn't move as much. But when you sit down, when you lean on something, you hug somebody or you do any kind of extreme dancing, that line isn't straight anymore, it's

very wavy, it's very all over the place. So it's a learning process." P8 and P14 mentioned taking the audience's perception into account as they were ideating their piece, noting how difficult it is to know whether they will perceive the intended meaning. All these choices participants were making were informed by other people.

Several participants discussed their garments (P7, P8, P12, P15) or Statement Making itself (P5, P8, P12) as a way of informing others about specific topics such as the waste associated with the clothing industry or to prompt them to think about their own usage of social media. Interestingly, none of the participants described their garments as "solving" problems, even if they were related to real-world problems. Some specifically realized the limitations of what they made. P8, whose garment was about water waste in the clothing industry, said, "we are sustainable in our ideas but not our execution". P5 and P15 realized that the ideas behind their project may become clear during conversations, but the garment likely did not speak for itself to carry the message to the audience. P15 also realized the complexity of designing technology that influences human behavior: "we had to make sure that we involved the glove which was human centered. And it's not like we created a robot that would tell you - you've been on blah blah blah. [Rather], you put on the clothes and you're now enveloped in the technology." In other words, P15 created a glove that naturally "envelopes" the user to guide toward new behavior instead of a brute force approach that tells them to change their behavior explicitly. There seems to

be a good balance between having a forward-thinking and optimistic perception of their projects and realizing the limits of the outcomes they are able to achieve, which is a healthy alternative to the technosolutionism that is one of the central critiques of the making phenomenon.

Statement Making was also seen as a way to help participants realize what resources they have access to or realize their own agency for doing something meaningful (P5, P7, P8). P7 said, “making a statement, just like on the front of the line, not the back. You become a leader. You be like ‘oh yeah, maybe that person who I’ve always known that wasn’t really much and can do something that big, maybe I can do the same thing.’” This is important because some of the barriers associated with makerspaces are that potential participants do not know what is possible. One of Schneider’s definitions of empowerment includes the psychological component of knowing what is possible and having a sense of agency to develop the skills to accomplish it [46].

P4 and P12 discussed limitations and possibilities of technology more broadly. Both P4 and P12 participated in a design studio course that explored the broad impact of technology on society explicitly, but they both also associated these ideas with Statement Making itself. P12 reported now thinking about “a lot of questions as in like what are we going to do about certain things... we depend so much on technology for so many things and its troubling to think about the what ifs. And now that’s really in my head after doing all this. And I think that’s good. Because I think I’m becoming more thoughtful about what I’m doing and what’s happening but it is interesting because I never really thought about it too much before.” P4 also pointed out how the prompt was much more vague than anything they had responded to before, which required a different type of thinking. P12 and P13 also expressed some general thoughts on the limits and possibilities of the future of technology, which may have been prompted by Statement Making or may have been thoughts they had anyway. Both discussed the fine line between technology that has a positive impact and a negative impact: “if you take a kitchen knife and start swinging it around, it looks very scary. But if you see someone cooking with it, you’re going to be hopeful that it’s going to taste good, so I think it’s kind of in the same vein. I think there’s a lot of things once you start getting technology into it, it’s really cool. Like I mentioned before, my grandmother has Alzheimer’s. It would be really cool to have some sort of chip on her so every time she ran away, I know exactly where she is. But then think about me being twenty one and having that exact same chip on me, is now a more terrifying concept” (P13). P13 also thought that one of the best ways for people to navigate this technology-heavy world is to be equipped with knowledge about how the technology operates in order to make the best decisions. P4 commented on how these realizations such as “are we really that like blinded by social media, by the technology that we have” prompt “reflections on yourself as a designer”.

These are all important concepts to be in the consciousness of the making phenomenon since makers may be the ones creating the types of technologies that the participants were discussing the positive and negative implications of. Statement Making may have prompted these conversations, or was at least a context around which these conversations could happen. The next steps related to this aspect of feminist utopianism would be to extend these

conversations to think about how these insights about the future should inform current choices.

7.3.3 Flexible Ideas. There was evidence of participants changing their minds about something as well as evidence of how they associated Statement Making with the possibility for multiple interpretations. When asked what Statement Making was about or what it meant, there was no single answer and some participants pointed out how it left room for interpretation. For example, P5 said “there is no specific guidance. It’s not make a political statement or make an environmental statement. We interpreted that as this is who I am this is the cross section of my reality. Other people interpret that as we are going to make a statement about the environment. Or a statement about resources or abortion rights or what have you.”

Some participants expressed flexibility in their making process (P1, P2) or in the ideas they associated with their project (P1, P2, P14, P15). P1 and P14 both participated multiple years, and both changed from a more technology-based focus to a more meaning-based focus throughout their participation. P14 reported being “really happy” they took a different approach “because it gave me a whole other perception on something that I thought I understood previously.” P15 looked back at the piece they created and pointed out ways they “kind of disagree with the statement” they made. If this was a hackathon or a competition-based format, participants would have to stand by their products or sell them to the judges whether or not they really believed in them. Statement Making provided room for this more balanced perspective.

Statement Making prompted some participants to consider changing their own behavior or prompted them to consider alternate perceptions of technology. P12 looked at their screen time and tried to limit their usage; P14, whose garment made a statement about toxic masculinity, reflected on their relationships with men and emotions. P4 and P12 commented on technology in the world, questioning the pervasiveness of social media and other technologies, and wondering if there are other ways things could be.

7.3.4 Flexible Futures. P5, P7, P8, P14, and P16 explicitly discussed Statement Making as an opportunity for learning. P16 wanted to learn parametric design to later apply to processes in architecture. P5 reported that Statement Making “gave me a lot of the communication skills necessary to be a better user-based designer”. P14 participated for the purpose of general broadening of skills: “when I make things, I like to make things a little out of my element. If no one stopped me, I would be writing software until the end of time. Opportunities that allow me to branch out and work with fabric, which is something I’ve never worked with before, work with fashion, get at least an experience to talk to a lot of artists and what their experience with the makerspace movement was. And just being able to branch out and not constantly write software for every single creative thing I do.” These types of learning endeavors are in line with the feminist utopian criteria for flexible futures because they show a desire to hone a broad set of skills for various purposes.

There were other ways participants showed flexibility during their Statement Making endeavor and were not set on achieving one particular thing. Several participants did not know what they

were going to make when they started, but let various factors influence their ideas (P1, P5, P12, P4, P14). P1 and P5 both let the model's ideas and preferences drive the process. P14 had an idea for the technology they would use (computer vision), but was open to applying it in various ways and ultimately made a statement about toxic masculinity. All these participants were also working in collaborative groups while they were designing, which may have influenced the flexible outcomes they were open to.

P2, P12, and P16 all reported other types of flexibility in their making process, particularly in response to learning about constraints embedded within the tools and materials. For example, P2 went through a "trial and error experimentation process" to fit the LEDs to a jacket. When asked what strategy they would use if they participated again, P12 said "probably just tinkering with it like we did in our class". While this sort of material experimentation is not unique to Statement Making, the fact that it was there alongside the more refined idea-driven endeavors shows that Statement Making is still a maker event. It is important relative to feminist utopianism because it shows an appreciation for the explorability of materials and discovery based on emergent properties.

There was also evidence of participants thinking about the different possibilities for the future of technology (P1, P4, P12, P13, P15, P16). Some of them were asking themselves "what if" questions about the possibilities and others saw Statement Making as exploring some of those "what ifs". P15 said "I think all the statements are like ok - here we are now. This is where we will end up in the future, whether that's good or bad. Or this is how we can end up, this might be better for the future". P1 thought of Statement Making as similar to Black Mirror, a show that tells technology-centric stories in various dystopian near-future worlds. Similar to Black Mirror, they saw Statement Making as exploring "how do people interact with clothing, how do they interact with the world? How do the things we wear have to say about that? ... Do computers have a role to play in wearables?" This flexible mindset towards the future of technology is in line with feminist utopianism because it involves simultaneously considering multiple possible futures and thinking carefully about what they each mean.

Some participants also discussed their own relationship to the emerging future of technology or what an individual's relationship to that future could be (P2, P8, P12). Their ideas were in line with feminist utopianism in that they saw themselves as situated amongst many other people and were aware of the ambiguities or uncertainty of trying to steer things a certain way. For example, P12 and P8 both tackled complex problems (addiction to social media and waste created by the clothing industry) not in terms of a technological solution, but rather in terms of aiming to inform or educate people about the topic. P12 did not think that one person could alter the course of trends in technology, but could "start a movement" by getting people to think and then they start conversations with others and the ideas spread. P2 discussed their project in terms of being the starting point for an "elevated" culture of light-up clothing. P2 talked about how everyone adds their own energies to the jacket they made and how some of the terminology associated with Statement Making "gets me thinking before I even know what it is". Overall, this shows a way of thinking about and working towards a different future, but without a clear definition of what it will look like.

7.3.5 Interconnectedness. Many of the ways participants commented on interconnectedness and diversity had to do with ways in which Statement Making showcased different viewpoints or perspectives next to each other, or how Statement Making drew attention to interconnections that would otherwise be unnoticed. Several participants pointed out how there were many different approaches or interpretations on the same stage (P1, P7, P12, P13, P14, P16). They all valued this diversity for reasons such as expanding their own viewpoints or seeing what else is possible. P16 initially "thought it was kind of odd" and "wasn't sure what direction it was supposed to be in" but later appreciated it for the purpose of understanding perspectives beyond the ones you might typically encounter. P12, P13, and P14 also commented on how there were similarities across the differences, such as how this was a "group of people that are all doing the same thing but in such different ways" (P14) or how despite there being a split between pieces "that were making a statement and ones that were technical", they also "feel like there were some pieces that kind of meshed together and kept it coherent" (P13).

Some of the specific connections participants noticed were between different disciplines (P8, P13, P14, P15). P15 "learned there is a group of computer science - I wouldn't call it a subset of CS, but there's a mix between UX, UI, computer science, and humanitarianism. Didn't know that was ever a thing. I feel kind of dumb now, not thinking that way. But I didn't think that you could mix computer science and art." P14 appreciated how Statement Making provided an "opportunity to break the silo and communicate with other people and talk to other people who have very different ways of thinking... just not getting into the group think mentality." Other than disciplinary differences, participants observed that differing viewpoints were supported (P4, P5, P13). P5 said that Statement Making "opened up a lot of conversations that I think in a lot of spaces wouldn't have been as cordial and as civil" and P13 noticed how "there wasn't any arguing despite some of the more loaded pieces, I suppose. It was all supported whether or not that person agreed with any of it." Some of the pieces aimed to shed light on marginalized experiences (P5), such as the cultural heritage of the model or what it is like to wear a prosthetic (P1), and some participants shared ways they learned about experiences related to topics such as immigration, autism, or culture (P13, P6, P5). Similarly, there was evidence of participants trying to understand what others were saying or doing, and generally associated Statement Making as a context based on working towards mutual understanding (P15, P16). P2, P4, and P8 all expressed appreciation for the teams they had worked with and for teamwork in general. P13 felt a general connection to the other participants in the form of an "energy" they felt at all the events leading up to the show.

Another type of interconnectedness has to do with situatedness, considering the larger context in which a particular artifact, making endeavor, or event exists. P5 said, "I felt like I was part of something bigger than myself". P4 looked at the show like "taking one piece of the puzzle or a string and then you keep pulling. As I was watching the show being presented, it was just like pull one after another and Statement Making as a whole, there is so much to it", showing they were trying to figure out what the larger context means. P4 considered their own piece as situated in that context as well: "as a designer, from building our prototype, seeing all the

little work that goes into it, but then putting it onto the stage, it's really insightful. It's like being able to see that my prototype ties into something". P1 thought that the current events of the time influenced the participants: "you know it's a political time. People want to make statements. People have strong opinions about things that are going on... Maybe if it was twenty years ago, we'd just say 'make a cool thing'".

7.3.6 Active Pursuit of Radically Better Future. While many of the participants were pursuing an agenda of some sort throughout their participation, there were a few comments in particular that expressed a desire for a radically better future or a broader sense of possible change. Some of these mentioned specific ways that the general or local computing culture could change for the better (P4, P5, P14). P4 discussed feeling "pigeonholed" as a software developer and appreciated how Statement Making challenges this way of thinking: "with Statement Making, it is really grand, but I feel like it will push our department to motivate our students to kind of think as innovators. And not just people who code day in and day out." P5 pointed out how in the local computing scene, "we all like to pretend that we are super diverse and very progressive, but in reality that's not really true," and how Statement Making drives actual change in that direction. P2 spoke in more abstract terms about the future: "I consider myself a forerunner or just a person who is there before I'm even there. My ideas kind of shift into the future and I'm like hey - this. This is important, this matters." They also spoke of how one person's actions can spark others to join in and add their own ideas. When asked whether these ideas relate to Statement Making, they said that this is "everything about Statement Making". All these desires for a better future are in line with feminist utopianism in that they are forward thinking, but not in a specific or pre-determined way.

8 DISCUSSION

We reflect first on the extent to which Statement Making aligned with principles of feminist utopianism. Overall, we saw free and open participation in the form of makers feeling like they could pursue any type of making endeavor they wanted, feeling like they could be their complete self, and like they could express whatever they wanted. There was also free and open participation in the form of makers including others in their making process, such as collaborating with their model or incorporating stories from their friends and neighbors. There were several aspects makers drew upon to make informed choices and several aspects that helped them realize the limits and possibilities of the situation. Many of them drew upon input from their models, either as inspiration or as a constraint. There were also many conversations happening in and around Statement Making that served a similar purpose: some garments aimed to inform about specific topics such as water waste and some aimed to prompt reflection about where technology in general is headed. There was general flexibility in terms of how participants approached their projects, how they interpreted the prompt over time, how they viewed others' pieces, and how they perceived the event as a whole. This was related to the appreciation for interconnectedness and diversity that the show fostered. Participants noticed the wide range of differing view points present on a common stage and were able to find threads of coherence and

commonalities. There was also evidence that Statement Making was perceived as forward-thinking, but was not aiming towards any particular singular future. Several participants expressed desires or instincts towards radically better versions of the future without having a concrete definition of what that looks like. Overall, these are all aspects that are in line with the feminist utopia criteria and help us understand what a feminist utopia-aligned context for making might look like.

There are certainly ways Statement Making could be more aligned with feminist utopianism. As directors, we set criteria for inclusion, which may have barred some from participation. Aspects of the event such as the emphasis on digital fabrication rather than all types of making and how potential participants needed to first see value in making a wearable garment for a show represent typical maker norms that Statement Making did not fully depart from and that may have had an impact on who the event represents. As white women in Art and Computer Science, the directors embody some characteristics that are underrepresented in typical maker culture as well as some characteristics that are over-represented. While we had a larger group of students helping and tried to lead in a participatory way, this may still have had an impact on decisions that were made as well as how the event was perceived by students.

8.1 Implications for makerspace leaders

Our main research question was about how we as makerspace leaders should frame the practice and promise of making in a way that better helps guide our actions towards that promise. We reflect here on how feminist utopianism has shifted our framing of the practice and promise of making as well as ways that shift could influence our actions.

Feminist utopianism tells us that the promise of makerspaces is not to bring about a particular version of the future but rather to be a component in the unfolding of processes where multiple possible better futures are considered and pursued. Makerspaces do not represent a utopian glimmer of the future, but rather a utopian glimmer of a type of path along which better un-representable but possible versions of the future unfold. The promise of makerspaces is not a particular end result, but rather the type of path, type of processes, and types of interactions they have the potential to enable.

The practice of makerspaces (and the practice of maker leadership) is thus to pay attention to the path the makerspace is on and implement mechanisms that prompt the feminist utopia criteria such as flexibility, interconnectedness, and making informed choices. The practice of making happens through lived experience and involves developing an understanding of the possibilities, the pursuits and goals of others, the situated context, and flexibly moving forward. The practice of making is not necessarily about making artifacts, but about developing meaning and understanding. It is about realizing what is possible, thinking critically about the limits, and understanding others' perspectives, as well as the situated context. We have shown that McKenna's principles are helpful as a reflective lens to understand a past maker context and we suggest they may be helpful as a guide for maker leaders going forward. There are certainly academic and non-academic accounts of making that already align with this way of thinking, such as critical

making [11, 23], Bowler et al.'s prompts for mindful making [12], or Hope et al.'s feminist hackathons [24] among others, and we consider ourselves as fellow travelers to these endeavors. Insights about their efforts along with this shift in framing from end-state to process that we've presented can both inform our future efforts going forward. Specifically, these are some of the aspects of Statement Making that we believe contributed to the ways Statement Making aligned with principles of feminist utopia and that may be reasonable for maker leaders more generally to adopt.

Shift focus away from artifacts Part of what helped Statement Making align with the feminist utopia criteria was the way participants viewed each other's work and viewpoints: with curiosity, understanding, and awe. While the makerspace does not prohibit participants from these same perspectives, it perhaps does not do enough to prompt them. While any project conducted in the makerspace has meaning to the person who made it and perhaps others, it is up to the person who made it to advocate for it and for themselves. The makerspace context could play a larger role in drawing attention to the fact that things have meaning and the people who made them have viewpoints. Statement Making achieved this by providing a stage to showcase participants' efforts and by framing the participants' contributions as "statements", which emphasized the ideas and meaning *behind* the artifacts. Similarly, the stories we tell about making contexts could be less about the artifacts people created and more about what relationships were fostered or what endeavors were initiated.

Opportunity for social progress without being solutionist As soon as we frame a makerspace or a context for making in terms of a specific challenge or prompt such as 'helping the community', we make it much harder for many of the feminist utopian criteria to emerge because we have set a particular type of agenda. Several of the participants had a social agenda to push, but none of them saw themselves as trying to 'solve' it, rather they viewed their efforts as raising awareness, starting conversations, bringing certain narratives to the forefront, or exploring the nuances of the issue. This means that they are more likely to be on a flexible path where such better futures unfold.

Prompt awareness of situatedness Situatedness is an important part of understanding interconnectedness. It is not enough to just understand the different artifacts in relation to each other, one must also understand the context in which they were created, and the general technological landscape that all these artifacts are part of and are commenting on. Makerspace leaders can be sure to prompt similar reflections on situatedness. Oftentimes makerspaces have a rather individualistic emphasis, which is perhaps a remnant of the "rugged individualism" culture in computing [19]. This is reinforced by rhetoric of personalization and customization the makerspace provides [21]. To get away from this, makerspace leaders could shift from only talking about what "you the maker" can do to talking about what "we the makerspace" can do together or what "we the makerspace" are trying to figure out together. The specifics of this framing

would shift over time since the first thing that "we the makerspace" might be trying to figure out is "what are we the makerspace trying to figure out". While there is evidence of HCI researchers working to figure out the broader trends makerspaces are situated within [8, 33], we have not found evidence of those conversations happening in makerspaces or evidence of HCI researchers trying to prompt makers to think in that way.

Actively Pursue a Radically Better Future The above suggestions attempt to provide actual concrete guidance and as a result are rather incremental. We encourage makerspace leaders to meditate on the concepts of feminist utopianism and realize that the mechanisms by which they could be realized might require a departure from other aspects of the current reality. When we came up with Statement Making, we momentarily left behind the idea of thinking of a makerspace context as a physical space to thinking about it as an event or as culminating in a performance. Similarly, makerspace leaders could work with the makerspace participants to come up with different models, plans, formats, and endeavors. Also, Statement Making was started in response to critiques of the local campus maker culture and aimed to be different. Some students even joined because it offered something different. Makerspaces could try different endeavors that communicate "we are doing something different here" through different aesthetics, values, purposes, or prompts. If participants perceive the context they are operating within as standing in opposition to the norm in some way, that may prompt conversations, reflections, and other forms of considering versions of a radically better future.

Pluralism In line with the *flexible ideas* criteria of feminist utopianism, Statement Making was not concretely defined. Participants interpreted the prompt in different ways and assigned their own meaning to their pieces and to others'. We similarly need a flexible way of allowing different meanings to be assigned to endeavors in the makerspace. While makerspaces are technically open-ended and claim to allow any form of association the participants would like, a challenge is that there are a lot of pre-conceptions about what they are for. Statement Making allowed for a range of technological, political, artistic, expressive, problem-solving, future-imagining pieces without enumerating those categories beforehand, which would have inevitably left someone out. This also left room for different maker-related identities to participate. Makerspace leaders should similarly think about how to provide opportunities for these different types of endeavors to emerge. This suggestion is closely related to Bardzell's feminist HCI principle of pluralism [7], and is also an important component of feminist utopianism.

8.2 Implications for HCI's Agenda for Making

Feminist utopianism sheds light on new ways to think about the nature of the relationship between HCI and the making phenomenon. Much of the HCI literature on making paints an optimistic narrative of progress, where the making phenomenon represents a glimmer of a future abundant in participation, democracy, and

empowerment. By supporting making in any way, HCI claims to be inching towards this promise [44]. Despite known critiques, this narrative prevails [6]. Part of the reason might be that it is not clear what an HCI intervention in framing the practice and promise of making looks like. HCI faces similar questions relative to the making phenomenon that we as makerspace leaders faced relative to our own makerspace: How do HCI researchers contribute to any futuring projects in the domain of making without overstepping their bounds? How do HCI researchers balance their own agendas for the making phenomenon with the agendas of the community (or the agenda-less, open-ended spirit of the community)? Just like we as makerspace leaders have an imperative to not leave the space in a completely open-ended free-for-all format, HCI researchers have a similar imperative: In the absence of aligning with an improved perspective on the promises of the making phenomenon, HCI researchers risk continuing to reinforce a status quo that does not have broad participation and has not yet considered the unintended consequences. Perhaps the relationship between HCI and the making phenomenon might also be informed by feminist utopianism. Rather than thinking up an abstract end-goal (or ignoring the need to think beyond our immediate actions), maybe HCI researchers should develop a relationship and pathway for HCI and the making phenomenon to participate in the process of such a future emerging.

8.3 Implications for HCI's Commitment to Democratization

In many ways, our role as makerspace leaders relative to our makerspace is analogous to the way HCI influences society through design endeavors. In HCI, individual design endeavors may be framed by a vision of democratization, just as the practice of creating IoT devices in a makerspace is often framed in this way. In HCI, as in making, we do not have much guidance on how to pursue this goal directly or robustly [6]. As a result, many democratizing efforts in HCI are either so small that the politics are barely visible or they are in line with traditional utopianism and technological solutionism, where there is a narrative about a general abstract end-state and it is assumed that the technology in question will take us there [34].

If HCI were to take a feminist utopian approach to democratization going forward, researchers would need to move beyond several familiar frames of legitimacy. One consideration that comes to mind is the scale of a particular design endeavor. Innovation in HCI typically starts small and propagates out. For example, a group designs an artifact or a set of artifacts with the help of a subset of the overall user population. The designer evaluates artifacts based on the impact they intend for them to have on people around. In the context of Statement Making, however, there was no single perpetrator of feminist utopianism. We did not start by implementing feminist utopianism on a small scale and gradually expanding. We cannot claim to have instigated feminist utopianism, nor should we think about how we spread feminist utopianism. Rather, feminist utopianism was something that was distributed throughout the context and driven in part by each individual who participated. The directors of Statement Making defined the context and the participants did the rest. Statement Making was not a large scale event, but it was certainly larger than what we would have

done if we were trying to maintain control over how participation was configured.

It is difficult, but interesting, to imagine what a similar shift in scale would look like for HCI. We would need to move away from our instinct to start with an individual artifact or the interactions immediately surrounding the artifact and move away from our instinct that we are the ones who will drive or initiate change. We would need to figure out how a path can unfold everywhere within a given scope simultaneously at once without relying on someone initiating something that starts small and grows or propagates. We would need to figure out ways of doing this where we simultaneously let go of control so conversations can emerge everywhere, but where we still have a sense of responsibility over the consequences.

8.4 Limitations and Future Work

Our engagement with feminist theory did not take active consideration of intersectional aspects of identity such as race, sexual orientation, or socioeconomic status. While we view feminist HCI and feminist utopianism to be fellow travelers to other social justice approaches such as critical race theory-based or queer theory-based HCI [32, 40], we have not investigated this directly. There may be tensions between these different approaches or opportunities to draw from them in different ways. For example, a notable difference between critical race theory and feminist utopianism is the type of change they propose. Ogbonnaya-Ogburu et al. point out how incremental improvements to technology, no matter how noble the effort, will not necessarily overthrow the broader systems of oppression that need to be overthrown [40]. Feminist utopianism, while radical, is patient and imagines an endlessly unfolding path rather than focusing on the system as a whole. The question for future research is how these theories relate, what they cover, what they leave uncovered, and who they leave behind.

9 CONCLUSION

In this paper we discussed our experiences as makerspace leaders and some questions we faced as we tried to frame the practice and promise of making in a way that would help guide our actions to better fulfill that promise. We were involved in the running of Statement Making, a digital fabrication fashion show, that seemed to embody some aspects of the promise of making and we used feminist utopianism as a lens to better understand the event. In conclusion, we suggest that feminist utopianism is a useful construct for makerspace leaders to frame their thinking about the practice and promise of making. Adopting this framing involves a shift from trying to figure out the end goals of the makerspace or the making phenomenon to fostering specific characteristics of an unfolding path that the makerspace is on or is enabling. This shift applies similarly to HCI research endeavors for making and HCI design efforts aimed at democratization.

ACKNOWLEDGMENTS

We would like to thank Madison Dunaway and all the leaders, designers, and participants of Statement Making. This material is based upon work supported by the National Science Foundation under Grant No. 1723744, as well as the UNCC CCI GAANN fellowship. Thank you to the UNCC College of Computing and Informatics,

College of Arts and Architecture, Charlotte Green Initiative, and Chancellor's Diversity fund for their financial support of the Statement Making event. Thank you to the anonymous reviewers for their thoughtful feedback and suggestions.

REFERENCES

- [1] Alison Adam. 2005. Hacking into hacking: Gender and the hacker phenomenon. In *Gender, Ethics and Information Technology*. Springer, New York, NY, USA, 128–146.
- [2] Morgan G. Ames. 2015. Charismatic Technology. In *Proceedings of The Fifth Decennial Aarhus Conference on Critical Alternatives* (Aarhus, Denmark) (CA '15). Aarhus University Press, Aarhus N, 109–120. <https://doi.org/10.7146/aaahcc.v1i1.21199>
- [3] Morgan G. Ames, Jeffrey Bardzell, Shaowen Bardzell, Silvia Lindtner, David A. Mellis, and Daniela K. Rosner. 2014. Making Cultures: Empowerment, Participation, and Democracy - or Not? In *CHI '14 Extended Abstracts on Human Factors in Computing Systems* (Toronto, Ontario, Canada) (CHI EA '14). Association for Computing Machinery, New York, NY, USA, 1087–1092. <https://doi.org/10.1145/2559206.2579405>
- [4] Alison Arieff. 2014. Yes We Can. But Should We? <https://medium.com/reform/just-because-you-can-doesnt-mean-you-should-252fdbcf76c8>
- [5] Jeffrey Bardzell and Shaowen Bardzell. 2016. Humanistic HCI. *Interactions* 23, 2 (Feb. 2016), 20–29. <https://doi.org/10.1145/2888576>
- [6] Jeffrey Bardzell, Shaowen Bardzell, Cindy Lin, Silvia Lindtner, and Austin Toombs. 2017. HCI's Making Agendas. *Found. Trends Hum.-Comput. Interact.* 11, 3 (Dec. 2017), 126–200. <https://doi.org/10.1561/1100000066>
- [7] Shaowen Bardzell. 2010. Feminist HCI: Taking Stock and Outlining an Agenda for Design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 1301–1310. <https://doi.org/10.1145/1753326.1753521>
- [8] Shaowen Bardzell. 2018. Utopias of Participation: Feminism, Design, and the Futures. *ACM Trans. Comput.-Hum. Interact.* 25, 1, Article 6 (Feb. 2018), 24 pages. <https://doi.org/10.1145/3127359>
- [9] Shaowen Bardzell, Jeffrey Bardzell, and Sarah Ng. 2017. Supporting Cultures of Making: Technology, Policy, Visions, and Myths. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) (CHI '17). Association for Computing Machinery, New York, NY, USA, 6523–6535. <https://doi.org/10.1145/3025453.3025975>
- [10] Seyla Benhabib. 1992. *Situating the self: Gender, community, and postmodernism in contemporary ethics*. Routledge, New York, NY.
- [11] Loes Bogers and Letizia Chiappini. 2019. *The Critical Makers Reader: (Un)learning Technology*. Institute of Network Cultures, Amsterdam.
- [12] Leanne Bowler and Ryan Champagne. 2016. Mindful makers: Question prompts to help guide young peoples' critical technical practices in maker spaces in libraries, museums, and community-based youth organizations. *Library & Information Science Research* 38, 2 (2016), 117–124. <https://doi.org/10.1016/j.lisr.2016.04.006>
- [13] Glen Bull, Cleb Maddox, Gary Marks, Anita McAnear, Denise Schmidt, Lynne Schrum, Sharon Smaldino, Michael Spector, Debra Sprague, and Ann Thompson. 2010. Educational Implications of the Digital Fabrication Revolution. *Journal of Research on Technology in Education* 42, 4 (2010), 331–338. <https://doi.org/10.1080/15391523.2010.1078254>
- [14] Roberto Calderon, Sidney Fels, Junia Anacleto, Nemanja Memarovic, and W Travis Thompson. 2014. Hacking HCI3P: second workshop on human computer interaction in third places. In *Proceedings of the 2014 companion publication on Designing interactive systems*. ACM, Association for Computing Machinery, New York, NY, USA, 195–198. <https://doi.org/10.1145/2598784.2598797>
- [15] Debbie Chachra. 2015. Why I Am Not a Maker. *The Atlantic* (Jan 2015). <https://www.theatlantic.com/technology/archive/2015/01/why-i-am-not-a-maker/384767/>
- [16] John Dewey. 1923. *Democracy and education: An introduction to the philosophy of education*. Macmillan, New York, NY, USA.
- [17] John Dewey. 1954. *Public & its problems*. Ohio University Press, USA.
- [18] Paul Dourish. 2019. User Experience as Legitimacy Trap. *Interactions* 26, 6 (Oct. 2019), 46–49. <https://doi.org/10.1145/3358908>
- [19] Nathan Ensmenger. 2015. "Beards, Sandals, and Other Signs of Rugged Individualism": Masculine Culture within the Computing Professions. *Osiris* 30, 1 (2015), 38–65. <https://doi.org/10.1086/682955>
- [20] Sarah Fox, Rachel Rose Ulgado, and Daniela Rosner. 2015. Hacking Culture, Not Devices: Access and Recognition in Feminist Hackerspaces. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) (CSCW '15). Association for Computing Machinery, New York, NY, USA, 56–68. <https://doi.org/10.1145/2675133.2675223>
- [21] Neil Gershenfeld. 2008. *Fab: the coming revolution on your desktop—from personal computers to personal fabrication*. Basic Books, New York, NY, USA.
- [22] Neil Gershenfeld, Alan Gershenfeld, and Joel Cutcher-Gershenfeld. 2017. *Designing Reality*. Basic Books, New York, NY, USA.
- [23] Garnet Hertz. 2012. *Critical making*. Telharmonium Press, Hollywood, California.
- [24] Alexis Hope, Catherine D'Ignazio, Josephine Hoy, Rebecca Michelson, Jennifer Roberts, Kate Krontiris, and Ethan Zuckerman. 2019. Hackathons as Participatory Design: Iterating Feminist Utopias. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland UK) (CHI '19). Association for Computing Machinery, New York, NY, USA, 1–14. <https://doi.org/10.1145/3290605.3300291>
- [25] Yu-Chang Hsu, Sally Baldwin, and Yu-Hui Ching. 2017. Learning through making and maker education. *TechTrends* 61, 6 (2017), 589–594. <https://doi.org/10.1007/s11528-017-0172-6>
- [26] Julie S. Hui and Elizabeth M. Gerber. 2017. Developing Makerspaces as Sites of Entrepreneurship. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) (CSCW '17). Association for Computing Machinery, New York, NY, USA, 2023–2038. <https://doi.org/10.1145/2998181.2998264>
- [27] Amy Hurst and Jasmine Tobias. 2011. Empowering Individuals with Do-It-Yourself Assistive Technology. In *The Proceedings of the 13th International ACM SIGACCESS Conference on Computers and Accessibility* (Dundee, Scotland, UK) (ASSETS '11). Association for Computing Machinery, New York, NY, USA, 11–18. <https://doi.org/10.1145/2049536.2049541>
- [28] Greg Johnson. 2002. The situated self and utopian thinking. *Hypatia* 17, 3 (2002), 20–44. <https://doi.org/10.1111/j.1527-2001.2002.tb00939.x>
- [29] Stacey Kuznetsov and Eric Paulos. 2010. Rise of the Expert Amateur: DIY Projects, Communities, and Cultures. In *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries* (Reykjavik, Iceland) (NordiCHI '10). Association for Computing Machinery, New York, NY, USA, 295–304. <https://doi.org/10.1145/1868914.1868950>
- [30] Roxanne Leitão. 2019. Anticipating Smart Home Security and Privacy Threats with Survivors of Intimate Partner Abuse. In *Proceedings of the 2019 on Designing Interactive Systems Conference* (San Diego, CA, USA) (DIS '19). Association for Computing Machinery, New York, NY, USA, 527–539. <https://doi.org/10.1145/332276.3322366>
- [31] Ruth Levitas. 2013. *Utopia as method: The imaginary reconstitution of society*. Springer, New York, NY, USA.
- [32] Ann Light. 2011. HCI as heterodoxy: Technologies of identity and the queering of interaction with computers. *Interacting with Computers* 23, 5 (2011), 430–438. <https://doi.org/10.1016/j.intcom.2011.02.002>
- [33] Silvia Lindtner, Shaowen Bardzell, and Jeffrey Bardzell. 2016. Reconstituting the Utopian Vision of Making: HCI After Technosolutionism. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) (CHI '16). Association for Computing Machinery, New York, NY, USA, 1390–1402. <https://doi.org/10.1145/2858036.2858506>
- [34] Silvia Lindtner, Shaowen Bardzell, and Jeffrey Bardzell. 2018. Design and Intervention in the Age of "No Alternative". *Proc. ACM Hum.-Comput. Interact.* 2, CSCW, Article 109 (Nov. 2018), 21 pages. <https://doi.org/10.1145/3274378>
- [35] Silvia Lindtner, Garnet D. Hertz, and Paul Dourish. 2014. Emerging Sites of HCI Innovation: Hackerspaces, Hardware Startups & Incubators. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Toronto, Ontario, Canada) (CHI '14). Association for Computing Machinery, New York, NY, USA, 439–448. <https://doi.org/10.1145/2556288.2557132>
- [36] Silvia Lindtner and Cindy Lin. 2017. Making and its promises. *CoDesign* 13, 2 (2017), 70–82. <https://doi.org/10.1080/15710882.2017.1308518>
- [37] Jessica Lingel. 2016. The Poetics of Socio-Technical Space: Evaluating the Internet of Things Through Craft. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) (CHI '16). Association for Computing Machinery, New York, NY, USA, 815–826. <https://doi.org/10.1145/2858036.2858399>
- [38] Lee Martin. 2015. The promise of the maker movement for education. *Journal of Pre-College Engineering Education Research (J-PEER)* 5, 1 (2015), 4. <https://doi.org/10.7771/2157-9288.1099>
- [39] Erin McKenna. 2001. *The task of utopia: A pragmatist and feminist perspective*. Rowman & Littlefield Publishers, Lanham, MD, USA.
- [40] Ihudiya Finda Ogbonnaya-Ogburu, Angela D.R. Smith, Alexandra To, and Kentaro Toyama. 2020. Critical Race Theory for HCI. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) (CHI '20). Association for Computing Machinery, New York, NY, USA, 1–16. <https://doi.org/10.1145/3313831.3376392>
- [41] Johanna Okerlund, Madison Dunaway, Celine Latulipe, David Wilson, and Eric Paulos. 2018. Statement Making: A Maker Fashion Show Foregrounding Feminism, Gender, and Transdisciplinarity. In *Proceedings of the 2018 Designing Interactive Systems Conference* (Hong Kong, China) (DIS '18). Association for Computing Machinery, New York, NY, USA, 187–199. <https://doi.org/10.1145/3196709.3196754>
- [42] Jeremiah Parry-Hill, Patrick C. Shih, Jennifer Mankoff, and Daniel Ashbrook. 2017. Understanding Volunteer AT Fabricators: Opportunities and Challenges in DIY-AT for Others in e-NABLE. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) (CHI '17). Association for Computing Machinery, New York, NY, USA, 6184–6194. <https://doi.org/10.1145/3025453.3025804>

//doi.org/10.1145/3025453.3026045

- [43] Jennifer A. Rode. 2011. Reflexivity in Digital Anthropology. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Vancouver, BC, Canada) (CHI '11). Association for Computing Machinery, New York, NY, USA, 123–132. <https://doi.org/10.1145/1978942.1978961>
- [44] David Roedl, Shaowen Bardzell, and Jeffrey Bardzell. 2015. Sustainable Making? Balancing Optimism and Criticism in HCI Discourse. *ACM Trans. Comput.-Hum. Interact.* 22, 3, Article 15 (June 2015), 27 pages. <https://doi.org/10.1145/2699742>
- [45] Daniela Rosner and Jonathan Bean. 2009. Learning from IKEA Hacking: I'm Not One to Decoupage a Tabletop and Call It a Day.. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Boston, MA, USA) (CHI '09). Association for Computing Machinery, New York, NY, USA, 419–422. <https://doi.org/10.1145/1518701.1518768>
- [46] Hanna Schneider, Malin Eiband, Daniel Ullrich, and Andreas Butz. 2018. Empowerment in HCI - A Survey and Framework. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) (CHI '18). ACM, New York, NY, USA, Article 244, 14 pages. <https://doi.org/10.1145/3173543.3173818>
- [47] Theresa Jean Tanenbaum, Amanda M. Williams, Audrey Desjardins, and Karen Tanenbaum. 2013. Democratizing Technology: Pleasure, Utility and Expressiveness in DIY and Maker Practice. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Paris, France) (CHI '13). Association for Computing Machinery, New York, NY, USA, 2603–2612. <https://doi.org/10.1145/2470654.2481360>
- [48] Stephen Viller, Peter Worthy, Marie Bodén, Jason Weigel, Geraldine Fitzpatrick, Tom Rodden, and Ben Matthews. 2016. IoT: Designing for Human Values. In *Proceedings of the 2016 ACM Conference Companion Publication on Designing Interactive Systems* (Brisbane, QLD, Australia) (DIS '16 Companion). Association for Computing Machinery, New York, NY, USA, 61–64. <https://doi.org/10.1145/2908805.2913019>
- [49] Anna Waldman-Brown. 2017. Are We Apolitical Bourgeois Hobbyists Promoting a Materialist Patriarchy? <https://medium.com/@Annawab/are-we-apolitical-bourgeois-hobbyists-promoting-a-materialist-patriarchy-eee332372cf8>
- [50] Rolf H. Weber. 2010. Internet of Things – New security and privacy challenges. *Computer Law & Security Review* 26, 1 (2010), 23 – 30. <https://doi.org/10.1016/j.clsr.2009.11.008>
- [51] Matthew Wynn, Kyle Tillotson, Ryan Kao, Andrea Calderon, Andres Murillo, Javier Camargo, Rafael Mantilla, Brahian Rangel, Alvaro A. Cardenas, and Sandra Rueda. 2017. Sexual Intimacy in the Age of Smart Devices: Are We Practicing Safe IoT?. In *Proceedings of the 2017 Workshop on Internet of Things Security and Privacy* (Dallas, Texas, USA) (IoT&P '17). Association for Computing Machinery, New York, NY, USA, 25–30. <https://doi.org/10.1145/3139937.3139942>