

Hackathons as Participatory Design: Iterating Feminist Utopias

Alexis Hope
MIT Media Lab
Cambridge, MA, USA
ahope@mit.edu

Catherine D'Ignazio
Emerson College
Boston, MA, USA
catherine_dignazio@emerson.edu

Josephine Hoy
University of Washington
Seattle, WA, USA
joeyhoy@uw.edu

Rebecca Michelson
Independent Researcher
Boston, MA, USA
rebecca.michelson@gmail.com

Jennifer Roberts
Versed Education Group
Washington, D.C., USA
jennifer.roberts@
versededucationgroup.com

Kate Krontiris
Independent Researcher
Freetown, Sierra Leone
kate.krontiris@gmail.com

Ethan Zuckerman
MIT Media Lab
Cambridge, MA, USA
ethanz@mit.edu

ABSTRACT

Breastfeeding is not only a public health issue, but also a matter of economic and social justice. This paper presents an iteration of a participatory design process to create spaces for re-imagining products, services, systems, and policies that support breastfeeding in the United States. Our work contributes to a growing literature around making hackathons more inclusive and accessible, designing participatory processes that center marginalized voices, and incorporating systems- and relationship-based approaches to problem solving. By presenting an honest assessment of the successes and shortcomings of the first iteration of a hackathon, we explain how we re-structured the second *Make the Breast Pump Not Suck* hackathon in service of equity and systems design. Key to our re-imagining of conventional innovation structures is a focus on experience design, where joy and play serve as key strategies to help people and institutions build relationships across lines of difference. We conclude with a discussion of design principles applicable not only to designers of events, but to social movement researchers and HCI scholars trying to address oppression through the design of technologies and socio-technical systems.

CCS CONCEPTS

• **Human-centered computing** → **Participatory design.**

KEYWORDS

Hackathons; Maternal Health; Breastfeeding; Participatory Design; feminist HCI; intersectional HCI; Equity

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1 INTRODUCTION

While the short- and long-term health benefits of nursing to parents and babies are widely known, the ways in which breastfeeding functions as an economic and social justice issue in the United States are less acknowledged. Seven years after the Surgeon General's Call to Action to Support Breastfeeding [11], many parents in the U.S. get the message "breast is best." Breastfeeding can literally save lives—for every 597 women who optimally breastfeed, one maternal or child death is prevented [11]. The U.S. has comparatively high rates of infant and maternal mortality, and Dr. Jerome Adams, current Surgeon General, has written, "Breastfeeding is a key piece of the infant mortality puzzle" [1]. Breastfeeding protects against child infections, fosters brain development, and reduces the risk of obesity and diabetes for children. It decreases mothers' risk of breast cancer, ovarian cancer, and diabetes [11].



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Although public health experts agree that exclusive breastfeeding for six months is the optimal way to nourish new babies, 78 percent of parents in the US are unable to nurse for the recommended time [46]. To establish a milk supply in the first few weeks of a baby's life, parent and child must stay close. That is difficult in the U.S., which is the only industrialized nation without federally mandated paid family leave. Only 14 percent of civilian workers in the U.S. have access to paid leave, and they tend to occupy upper-income brackets [26]. Structural racism, classism, patriarchy, and other systems of oppression have rendered breastfeeding a luxury good, more easily accessible to privileged families.

Prior work at CHI has explored motherhood and HCI [7] as well as breastfeeding-supportive technologies and services. Examples include the development of a low-cost system to monitor breast milk pasteurization for milk bank donation [19]; Feedfinder, a digital application that helps parents find, review, and share public spaces amenable to breastfeeding [6]; and the process of co-design with breastfeeding mothers to create Milk Matters [59], a mobile application designed to encourage breastmilk donation.

We have been actively engaged with the design space around this topic for the past 5 years. Informed by feminist HCI, we undertook an analysis of over 1,000 mother-submitted ideas to improve the breast pump, a technology that allows mothers to collect and store their breast milk [28]. We also reported on the first iteration of a hackathon on this topic [27].

In this paper, we present an iteration of a participatory design process to create spaces for re-imagining products, services, systems, and policies to support breastfeeding in the U.S. What began as a hackathon grew into what we began to call a "breastfeeding festival," composed of many different co-located sites of participation. These spaces included a hackathon, a policy summit, an art exhibition, a product expo, a "baby village", and a Zine Library, among others. For each of these spaces, we describe efforts we undertook to make them radically welcoming to parents and babies, with a particular focus on mothers of color, low-wage workers and LGBTQ+ parents—groups who, historically, have not been centered at hackathons.

As many organizers of participatory design projects experience, democratic and liberatory ideals can be difficult to achieve in practice. In order to explain how our second iteration came to be, we present an honest assessment of the successes and shortcomings of the first iteration of the project, which manifested as a conventionally-structured hackathon. We describe our reflections after the first event and explain how we re-oriented the second *Make the Breast Pump Not Suck* hackathon towards intersectional and participatory design ideals. Through this case study, we present a reimagining of the hackathon model that foregrounds equity

and inclusion, confronts issues such as technological solutionism [43], values non-technical knowledges and skills, and utilizes joy and play as key strategies to bring people together and inspire creativity. In addition to the restructuring of the project, we also describe efforts that the white members of our project team undertook to understand how their white identities can impede their ability to work across lines of racial difference.

Our work contributes to a growing literature around making hackathons more inclusive, designing participatory processes that center marginalized voices, and incorporating systems- and relationship-based approaches to problem solving. Guided by principles of intersectionality and feminist HCI, we provide a tangible example of how HCI researchers, designers, and activists might design and run hackathon-style events in a more inclusive way: how we might make space for many ways of knowing and how we can be attendant to power dynamics before, during, and after large-scale participatory events.

This project also offers an example of a fruitful union between feminist utopianism and Participatory Design [10] approaches to addressing complex social problems. In our work, we move between both critical and generative modes of thought. The participatory commitments and utopian imagination we bring to bear on the complex topic of breastfeeding accommodate a plurality of voices and experiences—in other words, we reject the idea that there is one possible future that is best for everyone, and instead seek to ask questions such as: *Why are mothers, parents, and babies missing from conversations about the future? What might utopias look like for breastfeeding parents and their babies? More broadly, whose voices need to be present in innovation spaces to imagine and build many possible utopias and preferable futures?*

We conclude this paper with a discussion of design principles for those seeking to create spaces for participation and envision radically better futures. These principles are applicable not just to designers of events, but to social movement researchers and HCI scholars trying to address oppression through the design of technologies and socio-technical systems.

2 BACKGROUND

Hackathons

Initially construed as "problem-focused programming event[s]" [17] primarily concerned with software development, hackathons have expanded to encompass a range of technology modalities, issue areas, and participatory design activities [14, 57], including hacking for "social good" [45] and civic hackathons [4, 50], in which "the technological imagination and civic imagination collide" [51].

Hackathons have distinct limitations as a participatory model. Historians of computing point out that "ideas of how computing should be done often correspond closely with ideas of who should be doing the computing" [40]. These ideas influence both how (and to whom) hackathons are marketed and how (and for whom) events are structured. Staples of the hackathon format, such as marathon coding sessions where eating and sleeping are informal [17], may reflect some participants' preferences, but exclude others and signal a narrow definition of who belongs. Taylor and Clarke's hackathon fieldwork suggests that "the hackathon structure is often rigid, relying on the ingenuity and creativity of the attendees to work around its constraints" [57]. Such rigid structures can exclude potential hackathon participants alienated by predominantly American, white, able-bodied, cis male representations of technology culture, in addition to people with childcare responsibilities [57], work constraints, or limited access to transportation.

Other critiques of the hackathon format challenge the positivist epistemology that presumes a knowable, bounded problem space with an optimal, technical solution that can be tidily understood and prototyped in a weekend [29]. These assumptions lead to technological solutionism, defined by Evgeny Morozov as an uncritical approach that favors the making of the new over the maintenance of the existing [43]. Solutionism curtails systems thinking [39], an analytical approach to problem-solving that seeks to recognize and understand the elements, interconnections, and purpose(s) of systems that has been proposed as a necessary lens for catalyzing lasting social change [54]. Moreover, solutionist hackathons privilege certain types of computer technical expertise and limit debate, discussion, and difference among participants [36].

These qualities are incompatible with inclusion and equity, and undermine the utility of hackathons as a vehicle for social change. Still, the hackathon remains a celebrated model of collaboration, proliferating within corporate, educational, and civic contexts. Following Laurenellen McCann, we assert that hackathons demand to be hacked so that they might "encourage an outpouring of 'non-traditional' engagement with civic tech without alienating tech veterans" [38].

Intersectionality, Feminism, and HCI

Our work within the design space of breastfeeding has been guided by the epistemic and emancipatory commitments of feminist HCI, which accounts for situated knowledges [33] and lived experiences [22] and supports innovations that are "imbued with sensitivity to the central commitments of feminism—agency, fulfillment, identity and the self, equity, empowerment, diversity, and social justice" [8].

Feminist standpoint theory "attempts to reconfigure the epistemic terrain and valorize the marginal perspectives

of knowledge" [8]. In reconfiguring this terrain to explicitly recenter the margins, feminist HCI welcomes modes of thinking previously devalued by positivist models, including non-technical approaches and partnerships between individuals, institutions, and community activists as subject-matter experts and co-designers.

Prior work concerning feminist maker- and hackerspaces has explored cultures of craft-based knowledge, expanded definitions of "hacking," and practices of community-building [12, 48]. Research by Sophie Toupin found tensions between the feminist values and the dominant hacker narrative of openness [58]. Fox, Ulgado, and Rosner, conducting ethnographic fieldwork of feminist-identified makerspaces, observe identifications with 'intersectional feminism', though in some cases this may be more aspirational than reflective [32].

Following critiques of white liberal feminism by feminists of color [35, 42, 52], queer feminists [47], and post-colonial feminists [41], legal scholar Kimberlé Crenshaw formally introduced intersectionality to feminist thought in 1989 [24] and describes ways in which black women's experiences (and their options for redress against discrimination) are erased by the "single-axis framework" of identity dominant in feminist theory and civil rights law. Crenshaw argues that to remedy inequalities, we must consider how people sit at multiple, intersecting dimensions of privilege and oppression and, thus, should center "the needs and problems of those who are most disadvantaged" [25].

We assert that the epistemic and emancipatory commitments of feminist HCI require that we uncompromisingly adopt an intersectional lens, which "focuses on how various dimensions of identity (e.g., gender, race, and class) coalesce inseparably and relate to the conditions of one's surroundings" [49] and engenders work that undertakes an honest accounting of how marginalization is inflicted not only by the societies in which we live, but by our own design processes and artifacts.

Intersectional social justice-oriented design movements have worked to extend design as a tool for challenging injustices and systemic inequalities. For example, equityXdesign offers a framework and practice for refocusing design thinking toward racial equity work, in which "designing for the most affected and marginalized, letting their voices and experiences lead, and acknowledging the barriers to engagement are critical [to this process]" [34]. Similarly, Anti-Oppressive Design [53] and the Design Justice movement [23] require that design processes and artifacts be grounded in an intersectional understanding of oppression that centers the most marginalized and eschews universalist design principles that lead to erasure of multiply-burdened groups.

In proposing feminist utopian participatory design, Shaowen Bardzell offers "utopianism as an activity" [10], where commitments of feminist theory unite with the democratic values and proven methods of participatory design to envision and prefigure utopias in which publics can address complex social issues at scale. From this unity emerges "a sense that the responsibility to bring about, rather than wait for, the future is our burden, today" [9]. Our two hackathons draw from these intersectional feminist design frameworks and represent iterative steps towards prefiguring spaces for utopian visioning.

3 LEARNING FROM THE 2014 MAKE THE BREAST PUMP NOT SUCK HACKATHON

Our group has organized two hackathons, in 2014 and 2018. The first *Make the Breast Pump Not Suck* hackathon was held at the MIT Media Lab in 2014 [28]. Originally conceived to focus on the device and its user experience, the 2014 event convened 150 parents, designers, engineers, lactation consultants, midwives, and doctors. Teams worked for two days to make breast pumps more comfortable, smarter, and more integrated with mobile phones and online information systems. The first hackathon awarded first, second, and third place cash prizes sponsored by industry stakeholders such as breast pump companies and investors, who participated as exhibitors. Registration for the hackathon was first-come, first-served and prioritized domain diversity across design, engineering, lactation and clinical health, education, and parenting.

By many measures, our first hackathon was a success, temporarily transforming MIT into a space that welcomed babies and parents, as well as scholars. Two mothers who participated in the event returned to grad school in engineering the following year, directly based on their experience at the hackathon. Two undergraduates who participated wrote theses on breast pump innovation in 2015. The event garnered more than 90 articles in mainstream press outlets, and extensive social media coverage which helped promote the narrative that breast pumps and breastfeeding were worthy topics of innovation, explored at "elite" technical institutions like MIT. Three products workshopped at the first hackathon are now small startup businesses. Two large companies told us that they created new pumps directly based on what they learned at the event. Finally, we maintain a 2500+ member Facebook community that discusses breastfeeding innovation.

While we evaluated the first hackathon in a previous paper [27], this section describes how the first hackathon informed the design of the second iteration.

Systems

As part of our commitment to feminist HCI, we embrace the feminist qualities of reflexivity and self-disclosure [8]. Reflecting on the achievements of the first hackathon, we are careful to also learn from the ways we fell short of our aspirations. Following the viral attention that the event received in the news media, our group crowdsourced and analyzed more than 1000 ideas for how to improve the breast pumping experience. We detailed the results of analyzing our crowdsourced data set in our 2016 paper [27], outlining five use cases for breast pumps, and major themes for what mothers wanted from their breast pumps: mobility, comfort, easy cleaning, and discretion.

Alongside suggestions to improve the design of the breast pump, our data strongly reflected the more systemic challenges faced by postpartum women and parents in the U.S., which are well-documented in the clinical literature: lack of paid leave, inadequate health insurance, discrimination against nursing mothers in the workplace, and racial discrimination in prenatal and postpartum care. We came to see the shortcomings of the breast pump as symptomatic of a systemic disregard for the lives and experiences of mothers, parents, and babies. For example, *Mother 2783* pointed out that "Ultimately, no pumping technology can overcome the fact that our society pushes women back to work too early, with loads of supply-dropping stress about how costly childcare is, and until we fix that on the policy front, no pump is going to meaningfully change the landscape of what nursing mothers are up against" [27].

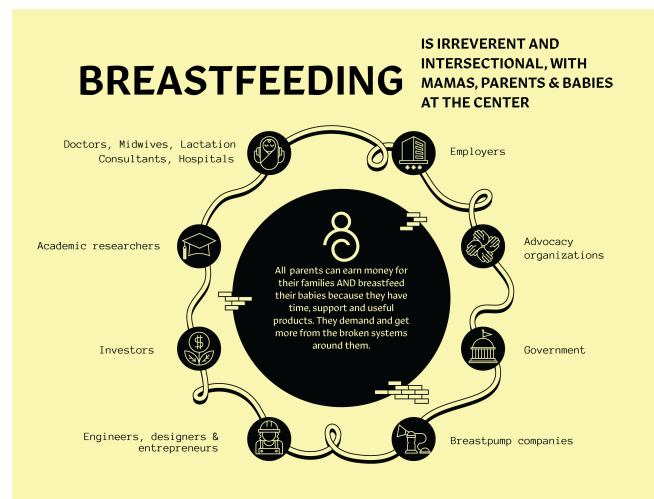


Figure 1: Future of Breastfeeding diagram, demonstrating a systems-thinking perspective on the topic of breastfeeding.

We participated in a CHI workshop about social justice [31] where we reflected on how keeping the focus narrowly

on the breast pump device was a way to let structural forces of oppression off the hook. *Instead of creating a well-designed band-aid for a broken social body, could we use participatory design to challenge the system itself?* We determined that the second iteration needed to focus less on the technical challenges of a device and take a more systemic perspective on postpartum health, encouraging innovations throughout the sub-par US maternal health system. This meant hacking not only pumps, but also government policy, workplace policy, lactation education, hospital birthing practices, and more (See Figure 1).

Equity in Innovation

More than five new breast pumps have come to market since our first hackathon, created by both established and emerging players, most of whom were present at the event. These innovative products have price points of \$400, \$500, and \$1000. The typical insurance provider in the U.S. reimburses between \$75-\$150 for a breast pump. What this means is that the best pumps are only accessible to those who can afford them out-of-pocket. These developments forced us to reckon with the crucial questions: *Who are we innovating for?* and *Whose voices are missing from this imagining of the future?* The designs generated at the first event reflected the needs and priorities of the hackers at the event: primarily white, well-educated knowledge workers with private offices, good health insurance, and disposable income. We did not see this oversight earlier because the majority of us fall into that group.

Incorporating the feminist HCI concept of the "marginal user" [8], we resolved to shift whose voices were at the center for the second event. This meant intentionally centering mothers and parents that face the most challenges to meeting their breastfeeding goals: mothers of color, low-wage workers, and/or LGBTQ+ parents. Given that the team undertaking the work was majority white (4 out of 6 co-organizers), college-educated, cis-gender, and heterosexual, we needed to undertake significant work in order to ensure a culturally grounded, respectful, and appropriate approach which we describe below.

4 VERSION 2.0: THE MAKE THE BREAST PUMP NOT SUCK HACKATHON & MAKE FAMILY LEAVE NOT SUCK POLICY SUMMIT

We began our event design process by reflecting on the structures and norms of conventional hackathons, drawing on our analysis of the first *Make the Breast Pump Not Suck* hackathon, our own experiences participating in other hackathons, and the hackathon literature described in previous sections. Major design goals included 1) centering equity, 2) focusing on systems in addition to technologies, 3) nurturing existing projects along with new ideas, 4) focusing on learning and

relationship-building, and 5) creating a playful and relaxing environment instead of a high-pressure, competitive environment. We determined that these goals would help set the stage for the collective imagining of future utopias. The following sections describe how we realized these goals.

Equity By Design

Demographics & Recruitment. Whereas the first hackathon was first-come, first-served, we decided to be more intentional about the participant demographics of the second event, with priority given to racial diversity, gender and sexuality diversity, geographic diversity, domain diversity and priority for young people and newcomers. We chose these metrics in order to prioritize voices that have been previously marginalized at hackathons and conversations around innovation.

An interesting team interaction occurred during this process. When establishing goals for racial diversity and inclusion, the Executive Director said, "How about 50 percent people of color?" The Equity and Inclusion Lead reminded the team that a space equally filled by white people and people of color will still feel like a white-dominated space, thus we increased our goal to 70 percent. Participants were recruited using social media, personal outreach through our partners, specific recruitment at Historically Black Colleges & Universities (HBCUs), and outreach to community organizations. This recruiting strategy, which focused on relationship-building and inclusive messaging, ensured that we met this goal. Similarly, we made intentional efforts to welcome and prioritize LGBTQ+ individuals and families. Finally, we provided funding for individuals who otherwise could not afford to attend.

Equity Workshop. To ensure that hackathon participants took a design approach that centered the marginal user, we began the first day with an equity and design workshop. Many participants had never participated in a hackathon before and had limited familiarity with design terminology. In addition, most participants had not previously designed with an intentional focus on equity and systemic bias.

The main purpose of the equity workshop was to introduce the participants to the equityXdesign framework, which retrofits the conventional human-centered design process with design principles that intentionally focus on equitable solutions for marginalized people and communities[34]. Participants were introduced to the framework's five principles. For example, "Design at the margins" urges participants to intentionally design with marginalized groups in mind first, with the understanding that less marginalized communities will still benefit from imagined solutions; "Start with

yourself" reminded designers to investigate their own biases. Participants gathered in small groups to examine the principles and consider how to apply them in the hackathon.

Our Core Values & Community Agreements. It was important to the core organizing team to be explicit about our values early in the planning process to ensure we remained aligned to our goals. We published a values statement [55] that highlights these commitments. Building on anti-oppression work that seeks to create a safe and brave space to build relationships, particularly facilitation resources offered by Anti-Oppression Resource & Training Alliance (AORTA) [3], we shared a set of Community Agreements with participants and asked them to uphold them in the space. Agreements included statements such as "Everyone matters. Everyone is welcome to contribute" and "We can't be articulate all the time." Recognizing that in an academic space many people may feel intimidated, the agreements were one way to show participants that the space belonged to them, that they should feel comfortable to bring their fully authentic selves to their work and expect to be respected for that. Both the Core Values and Community Agreements were hung on the walls in the main spaces as reminders.

The Role of Storytelling

While many hackathons include domain experts, it has been our observation that most do not include participants with direct, lived experience of the subject (with some exceptions, e.g. [14]). This can result in hackers, typically from dominant groups, relying solely on their own experiences and assumptions as a starting-point for problem solving.

As described previously, we countered this by directly welcoming participants with diverse lived experiences. Additionally, in advance of the event, we collected reproductive journeys from 33 parents and interviews with 15 care providers living in New England, the Southwest, California and Mississippi. All identified as parents of color, parents on limited budgets, and/or LGBTQ+ parents. Out of this effort we developed a printed book "Speaking our Truths: 27 Stories of What It's Really Like to Breastfeed and Pump in the United States" [56], which was distributed to each hackathon participant.

Our interviewees also participated in the event. We launched the event with a panel discussion comprised of seven parents from the book, each of whom shared her personal breastfeeding journey. Quotes from parent narratives were also hung up on the walls around the space.

Community Innovation Program

Early in the event planning process, our leadership team was challenged by the executive director of a community-based organization that serves Black mothers to not only

collect stories from underserved communities, but to uplift and elevate innovations from the community. Because of this helpful provocation, we created a nine-month "Community Innovation Program" which provided money and time for four teams (from Boston, Detroit, New Mexico, and Tupelo, MS) to research a problem space and idea to bring to the hackathon.

The program kicked off with a 2-day training at the MIT Media Lab where we learned about each other's work, seeded mentorship opportunities, practiced human-centered design activities, and set expectations for the hackathon. Afterwards, we hosted monthly meetings online for teams to share lessons and successes from their work. Teams took a variety of approaches to this preparation time. Some created high fidelity prototypes and conducted usability testing, while others used the time for deep identity reflection in service of their missions and values.

While these teams were grantees within the project, our relationships with them directly informed and shaped the event. Throughout the months leading up to the hackathon, they gave critical insight for how the work could be more inclusive and accessible. For example, during the kick-off they shared feedback that human-centered design can be reinscribe oppression because it can frame marginalized communities as "problems to be solved." In contrast, liberation frameworks help communities map their assets. Similarly, we learned to focus less on content delivery and more on building relationships. These lessons helped our team recognize the need for continuous feedback, and as a result we shaped the event to be more fluid and welcoming.

Space & Experience Design

The second hackathon was held again at the the MIT Media Lab. In general, the space has a modernist design, with transparent walls and the trappings of a prototypical technology start-up (e.g. ping pong tables and ubiquitous screens). During an early gathering of the Community Innovation Teams in the building, it became clear that the space read as sterile and uninviting to some newcomers.

Temporary Living Rooms, Art Exhibition, Zine Library & "Baby Village". To make the space more welcoming to a wider spectrum of people, including nursing parents and their young children, we used the stark, white walls as a canvas on which to build a warm, creative space. We brought in living room furniture, large plants, and rugs to create several clusters where participants could work, relax, and hang out. A sense of humor and playfulness ran through the design of all elements—from the t-shirt design that featured a dysfunctional illustration of a breast pump, to hundreds of "boob" cupcakes, to an array of 40 handcrafted, silly-shaped pillows for babies to climb on.

In the middle of the convening space ran an art exhibition, entitled "Between the Magic and the Machine," curated by Laura Zittrain, which featured 6 artists presenting a mixture of photographs and sculptural works exploring the contradictions of modern breastfeeding in Europe and America. One installation projected microscopic images of breast milk onto the walls of a cozy space lined with pillows and blankets, which also served as a nap room for parents and their sleepy children.

The Zine Library, near the temporary living rooms, featured self-published works, hand-made and distributed by the creators. Marya Errin Jones, curator of the library, described the collection as such: "These Zines are from all over the country and are made by Brown and Black people, women, cis and trans. There are how-to, fat positive, literary, and comic arts Zines." Although many of the walls were decorated with existing art, we encouraged the participants to make the space their own over the weekend and "take over" any unused walls. And they did, including in ways that remedied critical needs we had overlooked—one participant created an "All Gender Bathroom" sign and taped it over the existing sign for the Men's bathroom.

In addition to the temporary living rooms, participants also gathered in the "baby village." This was a site for parents and caregivers to relax with their children and included toys and healthy snacks. A trained masseuse offered massages for infants and parents. All restrooms, both near "baby village" and on other floors of the building, were outfitted with diapers, rash cream, lotion, and other amenities not typically available in technology spaces.

Spaces for Creation. The hackathon room was designed to be a teaching and learning space. Tables with materials were arranged in a semi-circle in the corner of the room around an assortment of floor rugs (rugs which later served as comfortable places for teams using the sewing machines to sit and assemble their pieces). Stations included: 3D-printing, sewing, electronics, and paper and foam prototyping. At one point, the announcement of the availability of a "2D printer" in this space generated a round of applause, which we take as a sign of the willingness of our participants to embrace both high- and low-tech tools.

Providing opportunities for beginners to learn how to use new tools and materials was a key goal of the hackathon. All areas were staffed by volunteers versed in the various technologies, and all tools were labeled so participants who had never previously encountered them would know what they were called. For many participants, this was the first time they had ever seen a 3D printer in action, and volunteers from Formlabs demoed the technology the entire weekend. Additionally, to demystify the inner workings of the breast pump itself, a volunteer created a 3D "exploded view" of a



Figure 2: Participants of the hackathon gathering in temporary rooms, using them as sites for discussion and creation.

pump that had been taken apart so people could see inside what traditionally serves as a "black box."

To encourage participants to leverage expertise in the room and provide a way for people to take ownership over the process, we introduced the norm of a "hot mic." In practice, this meant participants could come up to the microphone at the front of the room to make a request at any time. Sometimes this was related to seeking specific expertise (e.g. "We are looking for a mother willing to let us observe her breastfeeding"), while other requests related to practical matters (e.g. "Raise your hand if you have that last roll of tape!").

Science Fair & Prizes

In many hackathons, including our 2014 hackathon, the final demonstration of work is a pitch-style presentation, where teams present a demo of their creation on stage. Not only does this constrain the time available to each team, but it also precludes two-way communication and raises the stakes for "performing." In contrast, we were inspired by the Detroit Digital Justice Coalition's concept of *discotechs*. These peer-to-peer learning events, arranged in stations, create a space where people can *discover technology* together [20]. Instead of pitches, the hackathon concluded with a science fair, where each team stood next to their creation, often with supporting material like a poster, and spoke with participants, judges, and the public about their work. This opened up space for relationship-building and meaningful dialogue.

The second hackathon was also an opportunity to rethink prizes. Because the first hackathon had a grand prize winner and other rank-ordered prizes, we reflected on how the media had fixated on who "won." There were numerous news stories about the "winning team" and almost no stories about other equally worthwhile competitors. This kind of attention supports a solutionist approach, in which it is imagined that

a singular creation will "solve the problem," when in fact we need to focus on nurturing an ecosystem of care and innovation.

While we considered eliminating prizes and competition altogether, we heard from our advisory board that the competitive element made the event especially exciting. Thus, we determined to avoid rank-order prizes in favor of themed prizes ("The Healthy Communities Award", "The Information is Power Award", "The Superhero Award"). We worked with sponsors to create twelve prizes, so there would be many winning teams who might attract media coverage that could support their ongoing work. Prizes were sponsored by corporations, foundations, and nonprofit groups. Our sponsors had no input into the design and logistics of the event or into any team's process or output.

Instead of offering cash prizes or material goods, we urged sponsors to develop experiential prizes that would put their organization in deeper dialogue with each team. For example, the "Impact Award" included a two-day trip to consult with Medela's product designers and visit a NICU together. The "And Still We Rise Award", sponsored by Reaching Our Sisters Everywhere (ROSE), consisted of free entrance to the ROSE breastfeeding conference [30] and inclusion in a poster session. In this way, prizes functioned to build relationships and collaborations across stakeholders with differing levels of power and access in the ecosystem.

Policy Summit

As the team collected input from maternal and child health experts, we learned that paid family and medical leave is the single intervention with the most potential to support breastfeeding parents: Median breastfeeding rates in California doubled after ten years of paid leave at the state level [5]. The U.S. is the one of the only countries in the world to have no paid maternity leave. While the hackathon focused on products and programs, the Make Family Leave Policy Not Suck Summit aimed to "hack policy" by convening 60 advocates, academics, and community organizers to strategize about how center equity in the fight for paid leave. While states are increasingly passing paid leave laws, they are leaving out people who need it most, including agricultural workers, freelancers, domestic workers, and part-time workers.

We worked with the legal support firm ChangeLabs Solutions to shape the agenda, and the design firm Continuum to create interactive activities. Participants spent several hours envisioning ideal futures for equitable paid family leave and worked backwards to strategize pathways for success. This systems-based approach encouraged participants to think about multiple levers of change coming together: from within the workplace, to public policies, to grassroots advocacy campaigns and local elections strategies. Throughout the

event, storytelling interludes helped ground the conversations in empathy toward the need for equitable approaches. We facilitated knowledge sharing between the hackathon and the summit. For example, graphic recordings from the summit were displayed in shared common spaces, and Dr. Binta Beard, our Policy Summit Lead, delivered a policy summit wrap-up at the end of the hackathon.

Innovator's Gallery

The Innovator's Gallery was a product expo that included 26 breastfeeding and baby product companies. These included established breast pump manufacturers as well as new companies. Some exhibitors specialized in breastfeeding services and support—like Pacify which is a tele-health app, or Boober, which connects new moms with breastfeeding support ("Uber for boobs"). Other participants were new entrepreneurs, including three exhibitors who presented evolutions of their ideas from the 2014 hackathon—a breast pump cozy, a compression-based pump, and an infant feeding device for the car.

Because breastfeeding and pumping are stigmatized topics, they have not historically had a robust ecosystem of innovation. The purpose of the Innovator's Gallery was to provide a forum for companies to listen to and learn from participants, for hackers to interact with companies and ask them questions about their products or innovation process, and for large and small companies to learn from each other. To that end, we offered several networking events specifically for the entrepreneurs in the Gallery to learn more from each other, share information, and develop connections for future collaboration.

5 IMPACT STORIES

While it took years to fully understand the impact of the 2014 hackathon, previously reported on in [27], in this section we provide preliminary impact stories from the 2018 iteration. Our methodological perspective combines feminist HCI and Participatory Design, both of which emphasize iteration, relationship building, and reflexivity as methods for working across the power differences that can characterize the traditional researcher-research subject relationship.

As this is an ongoing participatory project that did not end with the second hackathon, our research methods involve continued and close contact with our participants, from whom we were able to gather stories of the event's impact through a combination of online surveys and follow-up interviews. The stories that follow give us reason to believe that the event was a success for many of the people and organizations that participated, as well as for advancing breastfeeding innovation more broadly.

Press & Media Impact

While the amount of press about the first hackathon was unexpected, we reflected in the ensuing years on the role of the press in disseminating messages about breastfeeding and design to a broad audience (such as "breastfeeding is worthy of innovation", "breastfeeding is normal"). Thus, we were very intentional in the second hackathon to architect a clear set of strategic messages to share with the press. These included using the novelty of the hackathon and the brand of MIT to attract mainstream media attention and then redirect that attention to the issues surrounding equity in breastfeeding and the lack of paid leave policy in the U.S.

While the first hackathon received more media coverage (quantitatively speaking), the second hackathon received more in-depth coverage that included reference to our key talking points about equity and access, paid leave policy, and features on community innovators who are making a difference despite structural barriers. For example, the second sentence of a feature in ABCNews stated, "Many other mothers have never experienced pumping or even breastfeeding because they are hindered by socioeconomic and cultural factors like racial bias and having to return to work soon after birth [37]." The headline of an article in *The Atlantic* stated, "The Problems With Breastfeeding Go Way Beyond Breast Pumps" [18].

Collaboration Impact

One of our primary goals for the hackathon was to seed new relationships and collaborations. While many of these are still unfolding, one successful collaboration has already been realized. A hackathon team led by Waetie Kumahia and Jenny Weaver wanted to work on opening careers paths for more lactation professionals of color. At the hackathon, they met Lakisha Cohill, whose photographs of Black women breastfeeding ("Breastfeeding Goddesses" [21]) were exhibited in the art gallery. They won the "Connections Award" from Ameda and resolved to work together to stage a large group photograph of Black women breastfeeding in Boston as a way to call attention to the resilience of Black mothers. With Ameda and a large online community called "the Leaky Boob" [15] providing design and marketing support, and with funding from the Boston Cultural Council, the group realized their photo shoot in August 2018 during Black Breastfeeding Week. They are now focused on circulating the result and furthering their ongoing mission "to assist breastfeeding mothers of color in the greater Boston area (and beyond) by sharing positive images and stories of breastfeeding families of color" [16].

Community Impact

Latona Giwa and Nikki Greenway, co-founders of the New Orleans Breastfeeding Center, led a team to win the "Information is Power Award" sponsored by Spectra. Based on their experiences on the Gulf Coast, their project consists of a kit to support breastfeeding mothers in natural disaster scenarios, such as a hurricane. Called InfantReady, it includes LED lights, a guide for manual expression, hand sanitizer, and a disposable infant feeding bag. In the months following the hackathon, the team raised \$25,000, presented to their city and state government, started a hashtag campaign (#InfantReady) and provided an infographic for the City of New Orleans website. Based on enthusiastic interest, they are now building towards a government contract and pursuing mass production of InfantReady.

Policy Impact

The hackathon brought together policymakers and advocates for paid family leave along with community-based organizations to design new products and services. While the interweaving of policy and design was a new endeavor for us, the organizers, it was not unfamiliar for the community innovators, many of whom regularly speak to their city and state representatives on behalf of breastfeeding parents and children.

In June of 2018, under the guidance of Binta Beard, our Policy Lead, we organized a "Policy Tour" in Washington D.C., which brought together eleven people, including four winning teams who participated in the hackathon. Our delegation met with representatives and senators from the states of New Mexico, Mississippi, Massachusetts, and Michigan. During each meeting, we shared information about the benefits of breastfeeding and paid family leave, and the hackathon participants talked about their broader breastfeeding advocacy work in their state, along with their specific innovations from the hackathon. The community innovators took away contact information and expressions of interest for a longer-term relationship in all cases.

Personal Impact

After the event, we received dozens of testimonials, survey responses, and reflections about the transformative value of the hackathon. Emergent themes of participant transformation include: new research directions and equity frameworks, collaborations outside of people's existing social circles, and new academic and career development pathways.

From these testimonials, we believe that the design of the event served our goal of making people feel truly welcome in an unfamiliar space. For example, one participant shared:

"The Hackathon was unlike any event I've ever attended...I felt like I belonged in a building that traditionally, I would have felt very on-edge in. Down to the last detail, these small, but intentional designs enabled me to truly come together with other women, and people."

The event also had an impact on those who already work in design and innovation within corporate settings. For example, one marketing executive shared:

"The most significant impact the event had for me was the emphasis on equity. In my career, I develop innovation for some of the world's largest organizations...and it's clear that the predominance of development happens for the Top 1 percent. I've spent 18 years in innovation and while I've often felt a lot of the ideas were frivolous, the impact was never as clearly crystalized as it was for me at this event."

6 DESIGN PRINCIPLES & DISCUSSION

Through reflecting on our experiences as organizers, feedback from participants, and the impact stories described in the previous section, we present 5 design principles for those seeking to incorporate a feminist and intersectional lens into participatory design processes. These principles evolved through a series of group meetings followed by individual reflections and represent the culmination of many months of sustained iteration following the event.

Intentionally Structure Equity

Focusing on equity helped us realize that imagining future utopias is a process, not a destination. As such, it is important to leave significant time to build relationships with stakeholders, community members and participants, and between organizing members themselves. An Advisory Board of trusted members of the breastfeeding and maternal health community served as key mentors for our work.

To ensure we, as organizers, were not perpetuating structural oppression, we dedicated time to examining our own identities, biases, power, and privilege and how to leverage some of these elements for the greater good of the project and communities being served. Additional meetings, specifically for the white members of the organizing team, were facilitated by a trusted Community Innovation Team member (also white) who is a trained anti-racist facilitator. These conversations were transformative in helping white members understand and confront the ways racism, oppression, and other forms of white supremacy manifest themselves. We believe this effort contributed significantly to the ability of the organizing team to accept difficult feedback and engage in course correction to foster a truly inclusive and equitable event.

We recommend that organizers of events intentionally structure equity by setting very specific goals around attendance and consider priming innovation activities with a workshop on equity. Additionally, culturally appropriate marketing materials—in our case, materials that illustrate women and parents of color and various family compositions—are a necessary signal for illustrating who is welcome in the space.

To ensure cost was not prohibitive for many of the people we hoped to attend, we provided funding for one-third of attendees to assist or fully cover their travel and lodging for the event. We acknowledge that we had significant financial and institutional resources available to us; that most organizers won't have this type of budget, infrastructure, or time. While this will necessarily constrain the size and shape of an event itself, we recommend looking for opportunities to build partnerships and collaborate with groups already working within the community.

Leverage Privilege and Institutional Power

Our team recognized the power of the MIT Media Lab as a brand closely associated with innovation in the technology industry, one sometimes criticized for creating technology for technology's sake. Consistent with the equityXdesign principle of "ceding power" [34], we saw that our work could help redistribute attention and resources associated with MIT to projects we recognized and demanded be considered as part of a broad culture of innovation.

While this strategy of redirecting institutional power was largely successful, we encountered unexpected culture clashes. The MIT Media Lab embraces a vision of open intellectual property (IP) that is common within many technology spaces, where many creators see licensing of IP as a barrier to collaboration and creativity. While institutional assurances that IP was openly licensed within MIT were meant to calm fears, they had the opposite effect. Some participants explained that as women of color, they were used to having their ideas adopted and repackaged and not receiving credit for their intellectual contributions. Ensuring that they retained ownership and control over their ideas was essential in ensuring they felt able to fully participate.

We also discovered that opening up MIT required far more than declaring our event free for all to attend. We needed to recruit and actively welcome, not just invite. This meant we had to provide travel funding, ensuring someone could attend instead of just inviting them to participate. Our late realization of this need was an oversight brought about by privilege—in academic circles, we can rely on MIT's brand to attract participation, while in this context, what mattered most was our active recruitment and support of participants.

Push for Narrative Change

Because they are still perceived as novel, hackathons can be an effective opportunity to attract and utilize attention from the press, particularly when there are high-profile institutions involved that will be of interest to the media. The risks of leveraging media attention are that 1) the attention flows back to the people and institutions who already have the most power, and 2) the media propagate a solutionist narrative about the issue in play. For example, after the first hackathon, a great deal of the news articles focused on the fact that MIT, of all places, was the site of a breast pump hackathon and made grand claims about the results, e.g. "Hackathon Revolutionizes the Breast Pump" [44]. This credits and elevates MIT, already prestigious and powerful, and implies that the powerful institution is going to solve the problem.

But the benefit of leveraging media attention is that it can be used to strategically re-frame an important issue for a broad public. Many sociotechnical issues of concern to feminist and intersectional HCI are associated with stigma and silence. In the case of breastfeeding, it is often framed as personal choice in the media ("do you or don't you?") which deflects attention from the structural barriers that prevent parents from realizing their breastfeeding goals. Kimberly Seals Allers, a health journalist and member of our Advisory Board, has asserted that "Presenting Breastfeeding As A Choice Is Contributing To Black Infant Deaths" [2] because not all mothers have equal access to "choose" breastfeeding. We worked to leverage the novelty of the event and the power of the institution to strategically re-frame breastfeeding around issues of equity and paid family leave policy. Because of our work to create a press kit and train the leadership team and the community innovation teams in media communication, the majority of news articles mentioned these issues.

A narrative change strategy can also be used to shift perceptions for other publics—for example, to shift the community of domain experts (which for us included many white-led breast pump companies, advocacy organizations, and lactation consultants) and hackers themselves towards greater consideration of equity and power. Here, our design book of stories and interviews was key. In the time since the hackathon, we have shared our results with breast pump companies, care providers, policy makers, and others through targeted briefings of our research findings.

Cultivate Joy and Play

We believe that joy and play are vital when designing spaces for individuals to come together with a generative spirit; physical and emotional comfort for all participants is key to both community-building and creative problem-solving. We

are particularly aware that the work of confronting structural oppression, sexism, and racism is both daunting in scope and emotionally difficult. Oppression is not an abstract problem to be solved, but shapes lived experiences, including experiences of multi-generational suffering. As a strategy of resistance, joy and play can offer a respite and an opportunity to connect across lines of difference.

We began the hackathon by inviting participants to embrace a spirit of joy and play, acknowledging that coming together with a playful spirit is not easy, or even possible for everybody, because society is not set up in a way to distribute those opportunities equally. However, we took considerable efforts to transform a sterile space into one full of warmth—from the cozy furniture to the tropical plants, the Art Exhibition to the Zine Library, the "Baby Village" to the boob-shaped cupcakes, these seemingly-frivolous details helped us create an environment that encouraged people to come together in joy to co-create a culture in which we could all play and learn.

We emphasized that this was a place where babies could cry and laugh freely, where we were all free to enjoy each other's company and the visual and material delights of the space, and where learning and relationship-building could happen alongside hard work, difficult conversations, and the re-imagining of more equitable futures.

Uplift Low-Tech and No-Tech Innovations

One of our key insights following the first hackathon was that breast pumps suck for more reasons than the design of the breast pump itself. Feminist HCI asks us to consider the ecology in which technologies participate [8]. Adopting a systems perspective about a sociotechnical problem space necessitates expanding the definition of what constitutes viable solutions to a problem that has social, cultural, political, historical, and technical facets. Our definition of "innovation" must expand when we work to shift complex systems and address systemic imbalances in power.

In our case, this meant embracing low- and no-tech proposals from hackers. Some teams worked on service delivery programs, like Chelesa Presley who is working to set up a home for pregnant mothers experiencing homelessness in the Mississippi delta. Others created paper-based self-advocacy tools, like AJ Hatter's team from Detroit who created a checklist for lactation consultants to help mothers of color develop a breastfeeding plan and advocate for themselves with health care providers who often make discriminatory assumptions. Others worked on clothing. The team from New Mexico, comprised mainly of indigenous women, "hacked" their traditional ceremonial clothing to make it more breastfeeding friendly. These important, culturally grounded innovations

are appropriate for their contexts, and they are already making a difference in their communities in a way that no app would have.

Embracing low- and no-tech innovations also means de-centering the techno-heroism present at many hackathons. The answer to wicked social problems is usually not more technology in the hands of the powerful. As Joseph Weizenbaum, creator of ELIZA, said in 1985:

"What the coming of the computer did, 'just in time,' was to make it unnecessary to create social inventions, to change the system in any way. So in that sense, the computer has acted as a fundamentally conservative force, a force which kept power or even solidified power where is already existed" [13].

Rather than solving the world's problems with design and technology, we assert that it is essential to explore how those domains may play a supporting role in augmenting existing innovations and innovators who are working to challenge and dismantle unjust structures of power.

7 FUTURE WORK & CONCLUSION

At present, our work involves the continued stewardship and support of the community that has emerged from the past five years of engagement with breastfeeding innovation research. In order to better understand the long-term impact this event may have had on participants' personal trajectories and connections between people and institutions that emerged from our gathering, we plan to undertake follow-up work in the coming months and years.

The design principles we offer in this paper are applicable not just to designers of events, but to social movement researchers and HCI scholars trying to address oppression through the design of technologies and socio-technical systems. In addition to providing an example of how to transform hackathons to make them more inclusive and participatory, this work can provide inspiration for the design of other innovation spaces, structures, and programming that need to be reimagined in order to challenge an unjust status quo and create equitable futures in which all can thrive.

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