

Hacking the Hackathon With Breast Pumps and Babies

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Abstract

In this paper, we present an in-depth case study of the "Make the Breast Pump Not Suck!" Hackathon at the MIT Media Lab in 2014. In recent years, there have been a proliferation of hackathons for social impact. Skeptics point out numerous shortcomings with hackathons, including poor problem-selection, diversity and inclusion issues around who participates, the exploitation of unpaid labor, the lack of impact and the dangers of positing purely technological solutions to sociotechnical issues. In the spirit of feminist epistemology, we first situate ourselves as the hackathon organizers, a small group mostly comprised of students at an elite engineering institution. Then we situate the focal object—the breast pump—as a sociotechnical design object that operates as a pain point at the intersection of social norms, historical and structural inequality, technological (un)innovation and flawed policy. We describe the event and outline our design goals, including prototyping new breast pumps, highlighting the inadequacy of family leave policy, promoting scientific advancement, and pushing on social and cultural norms inside and outside our institution. Finally, we evaluate the breast pump hackathon along four dimensions and offer a discussion of strategies to strengthen social impact hackathons.

Hackathons

A hackathon is typically an event, often 24 to 48 hours in length, where programmers, designers and others assemble, join teams and work on a challenge. Hackathons have been a community practice for over a decade in open source groups, hackerspaces, and companies. People participate to learn, signal their belonging to the group, and often to make something new. Many communities hold regular hackathons as one component of their larger initiatives (Matias and Brugh, 2014).

Hackathon origins are often traced back to early personal computer culture, and specifically to the legendary Homebrew Computer Club in the 1970s. The invitation language to join the Homebrewers sounds remarkably like the informal social promises made in contemporary hackathons: "Exchange information, swap ideas, talk shop, help work on a project, whatever..." (Adafruit 2015) While cooperative technical gatherings have long been common, it wasn't until 1999 that the term "hackathon" first appears. Coined by OpenBSD hackers to describe an event in June of that year in Calgary, Alberta (OpenBSD Hackathons n.d.) and for an event held by Sun Microsystems a few weeks later (Aviram 1999). Yahoo and Facebook helped popularize the hackathon as a competition, both to invent new projects and identify talented programmers as college students. "Hackathon" can now mean very different things: an open source cooperative development session, a competition to start new businesses, or a competition that showcases programming and design skills. The social change sector has been quick to embrace the hackathon in all its manifestations. You can find hackathons on water^[1], air quality (Meyer Maria 2012), corruption^[2], poverty^[3], health (Bhandari and Hayward n.d.), government and civics (D'Ignazio 2013) ^[4], and homelessness (Wolf 2014); as well as general-purpose do-gooding events (Geeks Without Borders 2015, Random Hacks of Kindness 2015,

SocialCoding4Good 2015).^[5]

The explosion of the hackathon as a working method raises questions for those who organize them, sponsor them, and attend them. Wishnie (2014) argues that hackathons encourage unrealistic expectations for what programmers can create in short periods of time, and notes that hackathons rarely produce technology that can be sustained after their creation. DeTar (2013) suggests that the brief time span of hackathons forces superficial solutions to complex problems while Porway (2013) suggests that hackathons are more likely to tackle challenges programmers face in their own lives, rather than the most pressing challenges. Gregg and DiSalvo (2013) argue that hackathons reduce complex social problems into oversimplified but solvable technical ones, a process Sasaki (2012) identifies as a form of Morozov's "solutionism" (Morozov 2014), where problems that do not have a technical solution do not get discussed. While these critiques of the hackathon form are valid, hackathons (to reduce ambiguity here) have become a possible path to influence powerful institutions.

Rather than abandon the hackathon as a social form, this paper examines ways to mitigate those critiques through design. In organizing the "Make the Breast Pump Not Suck!" Hackathon at the MIT Media Lab in September 2014, our team used strategies informed by our backgrounds in Critical Making, Human-Centered Design, and Interventionist Art Practice to mitigate issues of problem-selection, diversity/inclusion, impact, and technological solutionism that arise in hackathon culture.

While we had some success mitigating known limits of the hackathon method, additional unforeseen considerations arose. For example, adequately educating hackathon participants about a complex socio-biological-psychological process where scientific research is lacking is a challenge. And while we encouraged attendees to use the pump design object as a starting point to "hack" its context, including policy and social norms, few teams addressed those areas. Likewise, we were surprised at the extent to which the hackathon acted to gather collective energy around the topic and produce a community. It turned out to be essential for us to take on the less splashy "maintenance work" of growing and nurturing the pre- and post-hackathon community^[6] in order to fulfill our design goals.

Introducing the Breast Pump

Breast pumps are machines that help moms^[7] extract breast milk when they are not with their baby, as in the case of a parent working outside the home, or when a parent is with their baby but cannot breastfeed them. A mother might also extract milk to share with an adopted child or to bring to a milk bank. Breast pumps can be life-saving for babies born prematurely who are being cared for in a neonatal intensive care unit (NICU) who are too young to latch and whose immature digestive systems cannot handle any nutrition other than mother's milk. Breast pumps typically use vacuum and compression to trigger the mother's letdown mechanism, which makes the milk flow from the breast. Breast milk is collected in a bottle and can be fed to a baby through a bottle, dropper, tube, or cup.

The benefits of breastmilk to individual and public health are considerable. Breastfed babies have fewer incidences of short-term illness and lower risk of asthma, allergies and obesity. Breastfeeding

moms have lower risks for reproductive cancers. Leith Greenslade of the United Nations calls it the biggest missed opportunity in child survival because it is estimated that breastfeeding within the first hour of birth has the potential to reduce newborn deaths by up to 560,000 - 20% of the total 2.8 million annual newborn deaths (Greenslade 2014). The World Health Organization (WHO) recommends breastfeeding for at least the first two years of a child's life (WHO 2015). National policy recommendations are in place in many countries (AAP 2015, NHS 2015). And yet, breastfeeding is hard: it's hard to initiate the breastfeeding relationship and it is also hard to maintain it if social norms and family leave policy do not support it. Parental leave policy has not caught up with women entering the workforce either in emerging economies or in the US context. Indeed, the US has the highest number of pumping women but is considered a "Maternal Health Backwater" along with Liberia, Papua New Guinea, and Swaziland for being one of the only four countries in the world that do not grant paid parental leave on the birth of a new child. Mothers often return to a workplace that may not be supportive of breastfeeding, may not grant time to pump, may not have a space other than a bathroom or closet to pump, may not have a place to refrigerate pumped milk, and may not have colleagues that understand or appreciate what is going on.

Beyond the social, cultural and policy context, there are other structural forces at play in relationship to breastfeeding and pumping. Innovation in maternal health lags behind other sectors (Herrick et al 2014; Ching Yu et al 2006; Fisk & Atun 2008; Peterson et al 2012), partially because *we simply do not have the scientific understanding* of pregnancy, lactation, and the postpartum period to produce relevant innovations (Hinde 2015).



US Patent #US11135 A, Orwell H. Needham, 1854

Medela Symphony Pump, 2015

All of these aspects come into play when considering the breast pump as a sociotechnical design object and may account for the fact that the object itself has not significantly changed in design since a patent was filed for it in 1854. The design challenges of the object are numerous and fall into five categories.

(1) *Education & Resources*: Women often lack education and resources to try different pump models, flange sizes and to get proper fit. Electric pumps are expensive. Some insurers only cover inexpensive, poor quality pumps. Women without insurance cannot afford a pump. (2) *Difficulty*: Milk let-down, which depends on the oxytocin naturally produced by babies cooing and crying, and on relaxation, is difficult with a hard, plastic device. Pumping is an inorganic, medicalized, generally unpleasant process, often taking place in a stressful, time-crunched environment. (3) *Too Many Parts / Not Enough Parts*: Pumps come with lots of fiddly parts that need to be cleaned and sanitized between feedings. If you leave a part at home, the pump doesn't work. And yet, most do not come with accessories that make them hands-free so that women could be doing something other than holding cold plastic cups to their breasts for 15 minutes. (4) *Degrading*: Pumping is loud and mechanical, and has a generally medical and degrading feel; the mother is in a closed-off room, plugged into the wall, struggling to adjust and multitask, all while feeling rather like a cow being milked. (5) *Social Norms*: Breasts are sexualized. Breast pumping is treated like a hidden and embarrassing medical condition. Pumped breast milk is seen as a waste product rather than as a food product.

Who We Are and Where We Are Matter

"I am arguing for politics and epistemologies of location, positioning, and situating, where partiality and not universality is the condition of being heard to make rational knowledge claims. These are claims on people's lives. I am arguing for the view from a body, always a complex, contradictory, structuring, and structured body, versus the view from above, from nowhere, from simplicity. Only the god trick is forbidden." - Haraway, 1988, p. 589

Our small working group is composed of seven people who identify as designers, engineers, and artists^[8]—most of whom are, or were becoming, parents. Most of the organizing team is affiliated with the MIT Media Lab, either as students or research affiliates. The MIT Media Lab is known as a center of technology design and a prominent voice in discourse about the future. Founded in 1985, the lab initially saw itself as a home for “misfits” who did not belong in traditional academic departments or corporations, and emphasizes the building of provocative prototypes to demonstrate visions of future technology (MIT Media Lab 2012). The lab’s long-standing slogan, “Demo or Die,” has since morphed into “Deploy or Die,” reflecting the organization’s emerging focus on disseminating technologies into the wider world. The lab is funded largely by corporate sponsorship, with companies paying a yearly fee to be “members” of the lab. Though the funds are undirected—that is, students and professors are not obligated to build what member companies ask for—representatives from member companies regularly visit the lab for project demonstrations and provide feedback or other resources. As such, many projects at the Media Lab have links to industry, and many inventions eventually “spin out” to become commercial products (MIT Media Lab 2012).

Institutional support for the event was provided by the Director's Office of the MIT Media Lab and the Center for Civic Media (C4CM)^[9]. Initially we met in small, informal meetings. Our early conversations related to redesigning the breast pump itself to feel less medicalized, reengineering the pump to be more efficient or robust, and creating artistic interventions that would push society to reconsider how we think about breastfeeding in public spaces. We envisioned that these redesigned objects and spaces would themselves address larger social and cultural issues, as well as addressing the

design and engineering issues that made the object so detested by its users. We decided to host a small hackathon in the building, targeting other new parents among our peer group. One of our goals for this small hackathon, held May 21-22, 2014, was to put ourselves and our peers in conversation with midwives, lactation specialists, and medical researchers to help inform our early designs. After this event, we posted an account on the MIT Media Lab blog (D'Ignazio 2014), citing our group's email address in case readers wanted to offer suggestions for how to improve the breast pump. The post was widely shared across social media, and we received hundreds of emails with ideas for redesign, personal stories, affirmations of support for the premise of the project, and messages asserting that we should shift our focus to policy or education rather than pumps. This outpouring of interest led us to believe that there was a need for a larger, more public, critical conversation that we could help catalyze given our position within MIT. In response, we started planning a second, larger hackathon, called the "Make the Breast Pump Not Suck!" hackathon, which we describe in this paper.

Intellectual and practical backgrounds

In addition to our environmental context, the design of our hackathon was informed by our intellectual and practice-oriented backgrounds. Below, we briefly describe three frames that we drew upon as we conceived of the event: Critical Making, Human-Centered Design, and Interventionist Art Practice.

Critical Making

Inspired by constructionist pedagogies (Papert 1980), Critical Making is a perspective that advocates for hands-on making as an avenue for critical reflection on sociotechnical issues (Ratto 2011). Prototypes constructed through the Critical Making process are not intended to themselves embody critique; rather, the construction of these objects is intended to be a vehicle for discussion and reflection. Critical Making argues that the modes of criticality and innovation are more similar than typically thought, and we incorporated this perspective into the design of our event.

Critical Making and constructionist pedagogy emphasize the process of making and doing as the site of learning. Throughout the design of the breast pump hackathon we thought carefully about how the event could function as a space for education and reflection alongside the creation of material prototypes. While the resulting projects are important, we designed the experience so that talented, smart participants might learn about lactation, nursing, babies, and family leave policy in the process.

Human-Centered Design

Historically, the design of computing systems has taken a technology-driven approach, assuming that users will change their behavior to match the dictates of modern technologies (Oviatt 2006). Inspired by Participatory Design (PD), a Scandinavian research field emerging alongside worker's rights movements and unions in the 1970's, the field of Human-Centered Design (HCD) asserts that the relationship should be inverted, with technologies adapting and changing to match the realities faced by humans (Simonsen & Robertson 2012). Human-Centered Designers use theories and associated methods that consider a singular human or community's needs, motivations, desires, constraints, skills, and resources at each stage of the design process. In the HCD design process, designers interact with potential stakeholders and take an empathetic stance. This interaction and perspective helps designers

better understand stakeholder needs and motivations, and validate or reject design assumptions that led to prototypes. HCD methods can include design ethnography, surveys, focus groups, and usability testing, among others.

Human Centered Design values and methods informed our design decisions for the hackathon itself, and we also introduced HCD as a lens for participants in our hackathon as they developed potential solutions to problems facing breast pump users. We asked that teams be diverse, as the experiences and needs of actual users were the most important design input. As we had posted thousands of pump user stories and suggestions on hallway walls, one of the judging criteria for projects was how well teams incorporated user submitted ideas into their design rationale.

Interventionist Art Practice

Interventionist Art consists of tactics that engage and focus audience attention on issues of social and political relevance in unexpected ways and/or unexpected situations. Though it is claimed as an aesthetic activity, Interventionist work typically transpires outside of art situations like museums and galleries and stages encounters with non-art audiences. Nato Thompson, curator of the exhibition *The Interventionists: Art in the Social Sphere* (2004), describes interventionist tactics as "a motley assemblage of methods for bringing political issues to an audience outside the art world's insular doors." Thompson reads the rise of interventionist practices as the increasing competition for scarce public attention in a complex, commercialized and proliferating visual culture.

The utility of Interventionist Media Art practices to hackathons is to think carefully and strategically about how to leverage situation, context and media attention for maximum poetic, aesthetic and emotional effect. Interventionist tactics might include media hoaxes (the Yes Men), calculated disruption of media systems (Electronic Disturbance's FloodNet system), or billboard ads that advocate for gender equality (the Guerrilla Girls'). Humor is particularly important for its disarming and perspective-shifting capabilities. We leveraged these tactics in the carefully conceived naming of the event and throughout the event's production to cultivate a playful, approachable atmosphere in relation to an object that is seen as private and taboo. This spirit was picked up by the media as well. For example, to open their story on the breast pump hackathon, the usually staid BBC World News' Tim Wilcox offered an explanation of how Americans use the word *suck*, sounding much like a late-night comedy routine.

Design Strategies and Goals

We developed six strategies as a guide to address our design goals, informed by our backgrounds with Critical Making, Human-Centered Design, and Interventionist Art practice. We offer these strategies below as a list and then show how they mapped on to our design goals for the hackathon.

1. *Scope Narrowly, Imagine Broadly*: Choose a topic that gives people a personal entry point, and expand the conversation to address larger systemic issues.
2. *Users as Visionaries, Hackers as Listeners*: Leverage the lived experience of users, and center their expertise in the design process.
3. *Design for Diversity and Inclusion*: Model an inclusive, family-centered hackathon with space for

supportive partners. Provide scholarships to encourage participation by those who normally can not attend hackathons.

4. *Bring All Stakeholders to the Table*: Set aside dedicated space for users, families, educators, manufacturers, and researchers in addition to those who normally attend hackathons.

5. *Provide Post-Hackathon Support and Community*: Commit to relational and maintenance work to nurture the community that emerges from the hackathon.

6. *Humor*: Capture public attention to talk about issues that are often ignored, and make it easier to have open and honest conversations by reducing tension.

Design Goal #1: Prototype new designs to solve user interaction issues

One of our goals for this larger event, and the one which most easily mapped with what hackathons typically address, was to prototype and document new designs for the breast pump and breast-pumping experience. In our opening remarks, we seeded the audience with ideas by describing particular issues that could be taken on within the scope of a two-day hackathon. The issues included: the loud sound of the vacuum pump; the medicalized design; the lack of comfortable spaces for those who pump; the difficulty of cleaning the pump after use, among others. *Strategies: Scope Narrowly, Imagine Broadly; Users as Visionaries, Hackers as Listeners; Design for Diversity and Inclusion.*

Design Goal #2: Highlight inadequacy of public policy

During the event's opening remarks, we also suggested that teams consider public policy an object worth hacking. An additional design goal is to highlight the inadequacy of current United States family leave policy for supporting breastfeeding recommendations by top health organizations like the WHO and the American Academy of Pediatrics (AAP). After our first hackathon, we received critical comments from some who considered redesigning the object a distraction from the more important task of addressing the context which forces some women to pump. However, there are many cases in which mothers must pump for their babies—if the baby is born prematurely and in a NICU, or if the baby will not latch. Additionally, many mothers rely on the flexibility offered by the pump and the ability to pump and store extra milk. Thus, we believe the object itself still warrants redesign. However, we have continued to support conversations about public policy by facilitating such conversations on our event Facebook page, and talking about policy issues alongside other design issues. *Strategies: Users as Visionaries, Hackers as Listeners; Provide Post-Hackathon Support and Community*

Design Goal #3: Promote scientific advancement related to breastfeeding

By inviting lactation consultants, medical researchers, and midwives to the event, we endeavored to spark scientific and design research related to lactation and post-partum health of mothers, babies, and families. In our initial conversations with leaders in this space, we discovered that research on breastfeeding lags behind other health research areas and used that repeatedly as a talking point thereafter. By situating this event at MIT—a respected research institution—we were asserting that the subject was worthy of further study and attention. *Strategies: Bring All Stakeholders to the Table.*

Design Goal #4: Push on larger social and cultural norms by staging a media intervention

While we wanted to address the object itself and think about how to advance the science of

breastfeeding, we also wanted to push on larger social and cultural norms. In the United States, breastfeeding is largely considered a private activity, and breast milk is treated as medical waste rather than a food product. (It's the only food that's routinely taken into a bathroom, for instance). Talking about breast pumps in an engineering context (or any public context at all) can feel taboo. Because of this, breast pumps are an invisible technology, one that is not likely to be unveiled as a hot new gadget at the Consumer Electronics Show (CES). With this event, we wanted to critique a culture that prioritizes smart dog bowls over quieter breast pumps.

Part of our work leading up to the event, and after the event, was to discuss these issues in the public sphere by communicating our message to media organizations. Moving breast pumping into public discourse is a political act, and we aim to open up the space to say that the experience and object is worthy of attention, and not shameful or secret. The issue garnered much interest in traditional and social media, in part due to the provocative title of the event. A reporter at the Boston Globe told us she overheard a colleague in her newsroom saying "anything with 'breast pump' and 'hackathon' is *huge* right now." *Strategies: Humor; Design for Diversity and Inclusion.*

Design Goal #5: Make change close to home

Finally, we also wanted to stage an intervention on the MIT Media Lab culture itself. The Media Lab has been at the forefront of innovation rhetoric and has had a hand in shaping emergent technologies and possible futures, but we wanted to create a space for people who normally don't sit at the table for conversations about technology design. We aimed to impact our local community in addition to the wider world, and educate students, staff, and faculty of the Media Lab and MIT about breastfeeding and breastfeeding supportive technologies by creating a pedagogical space for people to learn about the issues of an audience that is underrepresented in the world of innovation. We hoped to open up a new space of imagination at the Media Lab for what topics warrant innovation, to push ourselves and our colleagues to consider health and wellness issues beyond those faced by male information workers. *Strategies: Bring All Stakeholders to the Table; Humor.*

Event Structure and Background

The "Make the Breast Pump Not Suck!" hackathon was held on September 20-21, 2014, in Cambridge, Massachusetts at the MIT Media Lab. Participants at the event were asked to register for a ticket within one of 6 categories: breast pump users, engineers, designers, healthcare experts, educators, and media. We elected to have a separate category for breast pump users in order to ensure there would be adequate representation of end users who brought other skills and interests to bear on the design process. Admission was free of charge but limited to 150 people. In addition to ticket-holders, we worked with sponsors to fund two scholarships for attendees who could represent the experiences of low-income breast pump users. The two women who received these scholarships, a NICU nurse and an exclusively pumping bartender, became resident advocates for the low-income perspective and generously mentored almost every team at the hackathon.

When participants arrived, they were asked to wear at least one colored sticker that signified their identities or expertises to others. Most participants wore stickers of multiple colors, signifying that they were, for example: an engineer and a breast pump user. This was to enable quick match-making for teams, as well as a quick visual check for adequate team diversity.

The hackathon was held in a large open atrium with 10 large circular tables surrounded by chairs. Booths from sponsor companies—health technology companies and manufacturers of breast pumps and breast pump accessories as well as baby care products—were arranged around the perimeter of the room.

The event began with quick opening remarks to contextualize the activities to follow. These opening remarks described the importance of breastfeeding, common pain points for users of breast pumps, and the political context for such a device to be so widely used in the United States. After the opening remarks, there were six “inspirational talks,” given by the judges for the event. These brief talks described current research on the recent discovery of stem cells in breast milk, the context of maternal care in low-resource environments, and advice on how to turn an early-stage hardware prototype into a product.

After the talks, participants were invited to brainstorm potential ideas, write or draw them on a large piece of paper, and come up to the front of the room to give “lightning pitches.” These pitches were timed and lasted 1 minute each, and not all participants addressed the room publically with their ideas. After the pitches, participants were served lunch and asked to talk to people with whom they shared common ideas to the purpose of forming teams.

Once participants chose their teams, the time was largely unstructured. Some teams moved to different parts of the building to work, though the majority stayed in the central atrium, where the materials table and a 3D-printer were located. All meals and snacks were also served in this common area. This balanced both a desire for quiet, focused work space as well as the serendipity of shared space and overheard conversation.

Adjacent to the main space was a children’s play area, with a diaper changing station and many toys. In this space was also a private lactation room, though participants were also encouraged to nurse freely wherever they wished. The restrooms were outfitted with personal care and grooming products. These amenities were included at the event to make it easier and more appealing for nursing mothers and families to participate in the event, which meant all attendees benefited from their presence and associated knowledge and creativity. We encouraged participants to bring a partner or friend to care for their children on site. As a result, there were many babies, both in the arms of their caretakers, or crawling on the floors between spaces, a perpetual reminder of why the event was taking place.

Between the children’s area and the main space was a wall of breast pump user stories. Our organizing team printed e-mails received after the initial blog post about the project, and hung them on the wall. Participants who arrived early were encouraged to read the stories and color code words or phrases within them according to themes including usability, policy, public spaces, medicalization, too many parts, among others. Teams were told that part of the criteria for the final judging would entail incorporating these user stories into their design rationale.

At the end of day one, each team described their progress, which for that day included ideation and

sketching as well as initial construction of prototypes by some groups. Requesting these presentations helped to keep teams on track and setting reasonable expectations for themselves. The event officially closed at 8pm that evening, though teams were invited to continue working in the space as long as they wanted.

The next morning, after a short welcome speech, teams continued their work. Event organizers and volunteers moved between teams to help source materials, develop ideas further, and identify and resolve impediments to team progress. Nurses, medical doctors and lactation consultants in attendance also worked as roving consultants, educating teams about breast anatomy and the science of lactation.

In the afternoon, teams were asked to create documentation for their work and upload this work to ChallengePost, a web platform that hosted our project documentation. In addition to this documentation, each team gave a 5-minute public pitch at the end of the event. Judges listened to the pitches and gave each team feedback. There were nine teams who presented prototypes. These projects included a bra that acted as a set of "helping hands" to manually express breastmilk by compression, a virtual reality simulation system to try out different pumps, a pump that more accurately mimicked the sucking of a baby, a toolbelt that allowed the user to discreetly pump and store milk, and a smartphone-driven pump that also provided community and advice to women while they were pumping.

Finally, the judges left the room to deliberate, and returned for the awards ceremony. In addition to first, second, and third place, the judging committee offered an award for "Outstanding User-Centered Design," as well as a "Pioneer Award," for a participant who had worked on a novel breast pump for years prior to attending the event. A supplement to the first place prize was a trip for two team members to pitch their ideas to Silicon Valley investors. After judging, teams mingled, celebrated, and shared ideas for future work.

Evaluation

While there is not a clear-cut rubric for success, we have been measuring the success of the "Make the Breast Pump Not Suck!" Hackathon in four ways: (1) *Tracking and nurturing forward project momentum* (2) *Connecting communities and participants* (3) *Interviewing participants and sponsors* (4) *Analyzing the media attention that the event received* and (5) *Noted changes at the MIT Media Lab.*

(1) Tracking and nurturing forward project momentum. The most visible continued work from the hackathon is the merger of three of the winning teams into the "Kohana" team. Members from Helping Hands (2nd place winners), Second Nature (User-Focused Design Award), and Compress Express (Pioneer Award) joined forces on a compression-based bra (as opposed to a vacuum-based pump). The Kohana team has entered the MIT \$100K Accelerator competition and pitched to VC showcases, angel investors and industry partners since the hackathon. A notable development is that the group decided to focus their efforts on developing the Gala Pump prototype that Susan Thompson/Kohana had developed prior to the hackathon. The utility of the hackathon, in this case, is not that it generated a transformative new technology but that it brought talented and driven collaborators together around an existing prototype and business that had already been in development for two years. Along the way, our team of organizers has tried to support the team members connecting with each other, accessing resources in the form of extra pumps or MIT lab space (we helped the team host a follow-up mini-

hackathon at the Media Lab in October), and connecting them with investors, breast pump users for feedback and other opportunities.

Some post-hackathon shuffling of team members happened for all the projects that are continuing to move forward. Dan Goodman, of the third-place Pump.IO team, joined forces with hackathon organizer Tal Aчитuv and Bundle team member Savannah Niles to further prototype Pump.IO into an open platform for breast pump research and development as part of two Media Lab fall classes: “Tools for Wellbeing” and “Engineering Health.” Goodman, Aчитuv, and Niles’ pump is called “Athena” after the Greek goddess of wisdom. It is powered by an Arduino and can be operated through a smartphone. Its innovations include improvements to the user experience making the pump parts interoperable, allowing users to mix and match elements from different pumps. This allows the user to try out how different popular pumps work for them without having to buy more than one pump (only buying the collection/flange systems for a fraction of the cost of another pump).

There are additional projects emerging from the hackathon that were not officially any single team's prototype. Aчитuv is working with researchers Efrat Goffer and Eran Jassby on a small, cheap add-on to consumer breast pumps that would facilitate the hygienic sharing of breast pumps and the development of a more vibrant secondary market for used breast pumps^[10]. And while the winning hackathon team, the "Mighty Mom" smart, discrete toolbelt, has not sustained their momentum, one member has continued to move forward on developing a breast pump accessory that muffles the noise that many women hate so much. This participant will be taking advantage of the team's first prize trip to Silicon Valley to meet with investors and develop his idea further. What is interesting about these developments is precisely that they did not see the light of day at the hackathon because they were possibly not considered "ambitious enough" for the spirit of the hackathon. In a follow-up interview, the Mighty Mom team member stated that he felt that his idea was too modest and simple to be worthy of the team's attention at the hackathon. Moreover, he felt intimidated by the technical atmosphere. This social pressure at hackathons to think only in *technological*, *transformative* and *disruptive* terms should be noted. We return to this in the Discussion section below.

In addition to projects, other classes at MIT and beyond have taken on maternal health and the breast pump as design challenges, which has been extremely exciting to witness. Two teams of undergraduates pitched the breast pump as their final design project for the Product Engineering Processes Mechanical Engineering capstone project. Though the project was not ultimately selected, more than ten students did significant research, 3D modeling and pump-hacking for their pitch. One undergraduate student, Xochitl Mellor, joined the Kohana team as a result of this work and is now developing her senior thesis project about the breast pump in spring 2015. Additionally, Aчитuv co-developed a winter session class called "Hacking Infant Health" with hackathon judge Nancy Holtzman and hackathon participant Naomi Bar-Yam, Executive Director at Mothers' Milk Bank Northeast. During the class, participants learned about challenges that the milk bank faces and brainstormed design solutions. Finally, a product design student from Umea Institute of Design in Sweden saw the hackathon, discussed the breast pump as a design challenge at an internship at IDEO and decided to focus his thesis on it, so we are currently connecting him to data, user stories and our larger community to help support his work.

While these projects have developed their own forward momentum, we organizers have helped nurture that momentum by staying in touch with the innovators, giving them encouragement that their ideas are worthy, publicizing their work (D'Ignazio 2015, forthcoming), showing up to their events, connecting them with potential collaborators and advisors and with tangible resources when possible. We have also been emphasizing the importance of a human-centered design process by connecting innovative projects to the user stories we collected and end users. We identify this work as "context and community building." Though these support actions are small, they have the cumulative effect of making it clear to participants that their work matters, that it is embedded in specific contexts in the real world, and that people are paying attention to its development beyond the PR splash of the hackathon event itself.

(2) Connecting communities and participants Likewise, one of the insights we gained from this experience is that hackathons, particularly those focused around social impact, produce communities. In the case of the breast pump hackathon, it was a committed community of frustrated breast pump users, maternal and global health advocates, lactation consultants, public health researchers, hardware and software developers, and designers, most with some kind of personal connection to the breast pump or to the field of maternal health. One of our most urgent questions post-hackathon is how we continue to maintain, connect and nurture that community. We set up a low-traffic email list and a "Hack the Breast Pump" Facebook group where participants have been posting follow-up surveys from teams and other innovators creating prototypes, US family leave policy updates, and articles on pumping and breastfeeding.

Additionally, we have tried to do opportunistic "match-making" between different people in this community. For example, we introduced Max Metral, who was on the Pump.IO team, to the hackathon judge Janica Alvarez whose company Naia Health is developing an improved breast pump. This meeting resulted in him joining their board. We connected Nancy Holtzman, another judge and speaker, to the hackathon sponsor company SimpleWishes who then connected them to another San Francisco-based company innovating in the same space. We connected Naomi Bar-Yam of the milk bank with the sponsor company Lasinoh so that they could figure out why their plastic bags were leaking when the milk bank defrosted them. Other connections did not have to be brokered through us. For example, Beth Kolko and Mar Hershenson connected by participating on the judging panel and have been mutually beneficial to each other regarding the venture and investing landscape in maternal health technologies. This work has taken place in a mostly ad-hoc, unsystematic way but it has led to the next step for our organizing team. In Spring 2015, we will partner with the MIT student group Hacking Medicine on their Grand Hack for Health, an annual event that attracts over 500 participants. We are helping to organize a high-profile prize for each of the four tracks of their hackathon to incentivize prototypes that relate to maternal and family health. In addition, we are helping them build a more inclusive hackathon space and developing a network of mentors to be present at the hackathon, do mini-lectures and inform project development at early stages.

(3) Interviewing participants and sponsors In the months following the event, we surveyed all participants and interviewed a handful of participants and sponsors to gather feedback about the event. The response to the event was overwhelmingly positive, with most participants commenting on the positive energy that permeated the atmosphere of the event. As one participant noted, "Great people, great ideas! It was the most exciting academic event I have attended for years—and I've been an

academic for 20 years.” Another said, “It was such a great experience that I will be trying to find whatever other opportunities I can to recreate it. If I could do a hackathon like that every weekend I would!”

Some participants were unsure if their teams would actually “do” anything after the event. Although one participant's team has merged into the Kohana team, the majority of her team members returned to their everyday lives and are not continuing to work on the project. This participant said she did her best to sustain the team's energy post-hackathon but felt that a return to "everyday life" was inevitable especially given that most attendees were parents. Another attendee expressed initial concern that he would not necessarily be welcome at the event, as he is a non-technical dad, but was pleased with the open and inclusive approach of the event. With most teams consisting of full-time professionals or students, he expressed that it was a challenge to coordinate and move projects forward, particularly since their prototype was not yet at the "quit-your-job" stage. Nevertheless, he stated that he was still buoyed and encouraged by the energy from the event to work on his prototype. One participant, Liz Slavovsky (a member of the Helping Hands team) was so inspired by the event that she decided to return to school in January 2015 at UMass Lowell to finish a mechanical engineering bachelor's degree that she started a decade ago. She plans to stay for a Masters degree.

We also spoke to four sponsor organizations to help us assess the impact of the event on companies who develop existing products. Three of the four had never before participated in a hackathon, and arrived with no expectations of how the event would work. All sponsors were impressed with the diversity of the hackathon participants and felt that different viewpoints helped with idea generation and validation. As one sponsor with hackathon experience noted, “The biggest difference was the constituency of the people coming to the hackathon...the participants were very different. You had nurses, people with MDs, lactation consultants, engineers, design people. It’s much more real. People are coming together to solve a real problem.” One other sponsor noted that, “It’s important to participate in things like this to help push the envelope.”

All four sponsors that we interviewed would consider participating in another hackathon, both personally and professionally; as one participant from a large maternal health company noted, “As an individual, I found it really motivating, inspiring, enriching - I’d love to do them in the future. As an organization, we would definitely look into doing (hackathons) again.” When considering the strengths and weaknesses of the hackathon as an event, all sponsors again felt that the different perspectives provided by the diversity of the event helped directly contributed to its success. “It was a really energizing experience, I had a lot of fun, it was really exciting and really inspiring just to see so many different people come together to solve a problem. I loved it and wouldn’t hesitate to do another one,” said one sponsor from a well-known maternal care organization. “It’s really important and exciting for our industry.” Sponsors were impressed by the passion for the breast pump as well. “There was a type of energy, a spirit, in the room where I felt like it was a sisterhood there, that the women were trying to help one other out. Not only the women, but the partners that are going through this with their wife. I thought that was pretty amazing.”

Like participants, sponsors expressed a concern about time—“you feel so restricted by the time”—but interestingly, half of them also indicated that a narrow timeline could be considered a strength as well, as it forces teams to focus and move their idea forward quickly. There was also concern around the

complexity of the topic; as one sponsor representative said, “I’m a certified lactation counselor, and there are a lot of intricate idiosyncrasies that go into breastfeeding and how it works, which is very integral to creating breast pumps. With the time constraints, it can be difficult for teams to synthesize those complex ideas around lactation into their ideas.” One sponsor also suggested gathering ideas in advance of the event to assist with validation and team formation—“Maybe you want to have something in the application where you get people to submit a couple of ideas before they come.”

All of our interviewed sponsors talked about the "Make the Breast Pump Not Suck!" hackathon extensively within their organizations and are exploring (and in some cases, revisiting) ideas that emerged at the event. “It’s great to see that you’ve reached out to consumers and asked for their input prior to the event, it’s very similar to what we’re hearing on a daily basis, and what we’re passing along to our innovation team [at our company]. It’s an honor to be at the hackathon as a sponsor. We love to see this much attention being given to our industry, to breastfeeding, and to breast pumping.” Understandably, none of the breast pump companies we spoke with could provide details on which ideas they are considering or exploring for further development.

The “hackathon” format itself helped changed the way that some sponsors look at collaboration within their businesses in general. “Overall and broadly, is this an approach that we should be considering for innovation in other spaces? It really opened up our way of thinking about the way we approach these types of projects, and I think that will come through with what we’re able to deliver to the market. Overall, it was a really fantastic experience.” All sponsors enthusiastically indicated that they would participate in a hackathon in the future.

(4) Analyzing the media attention that the event received The "Make the Breast Pump Not Suck!" hackathon received a lot of press attention - 83 individual articles, blog posts, and radio episodes and counting. There is a story forthcoming in Elle Magazine in March 2015. It was named one of the top 20 reasons to love Boston by Boston Magazine (Ayanna, Keytar, and Menino 2014). It got written up in Forbes (Bahney 2014), the New Yorker (Nijhuis 2014), CNN (Kelly 2014) and Fast Company (Segran 2014). It was discussed on the BBC World News^[11], NPR (Yandel and Al-Sadi 2014), CBC (Young 2014), and WNYC (Lehrer 2014). It was featured on the front page of MIT's student newspaper and as the lead news story on the www.mit.edu portal. It went viral on social media^{[12],[13]} where users applauded the effort, offered their ideas, criticized the winners and debated about whether breast pumps should or should not suck by definition. The NPR podcast *The Longest Shortest Time* produced a 30-minute story about the hackathon (Frank 2014) through the perspective of a childless man and crowdsourced breast pump sounds from their listeners (ibid). And outlets like Boston.com produced video narratives of the experience (Levingston 2014).

In terms of our design goal to stage a media intervention to spark public conversation and push on social and cultural norms, we could not have hoped for a better response, at least in terms of sheer quantity. In the media frame analysis we did following the hackathon, several themes emerged.

(a) *Focus on MIT*. More than half of the published news pieces included MIT in the title of the article.

Likewise, 472 tweets of an archive of 754 total tweets about the hackathon made mention of MIT. The hackathon was often referred to as the "MIT Breast Pump Hackathon." In some cases, the framing around the institution of MIT was regarded with incredulity because MIT was perceived as "male-dominated" (Segran 2014) or with hope because MIT has high status in the tech and engineering world (Buxton 2014). Our position at an elite institution at a lab recognized for innovation was something we acknowledged publicly in interviews and sought to explicitly leverage in the service of legitimizing the topic of breastfeeding and pumping.

(b) *Focus on Winners*. The articles that came out the week following the hackathon focused a good deal of attention on the winners of the hackathon, describing their projects and how much money they won. In some cases, this provoked heated discussions on social media regarding the utility of the winning designs. For example, a comment by a lactation consultant on Facebook that had 289 responses noted, "Can't say I'm too impressed with what the teams came up with...Tracking fat content implies it is something a mom should concern herself with when she needn't. Moms who are pumping tend to be nervous enough about what they're producing as it is.^[14]" While the emphasis on winners is not how we tell the story, it is a useful frame for catalyzing discussion about what *should* be winning and what are the features to prioritize.

(c) *Focus on Uneven Innovation*. As William Gibson's famous quote goes, "The future is already here—it's just not very evenly distributed." (The Science in Science Fiction 1999) This was a key talking point that we organizers learned at our first hackathon, discussed in advance of the second and brought up frequently in interviews. We wrote about it in our first blog post and state it as a goal on the hackathon's web page (Achituv et al 2014). A number of media stories picked up on the idea that innovation in the space of maternal and neonatal health lags behind other areas (REF 2-4 stories here). Perhaps trying to make opportunistic use of search engine optimization, sites like Quartz published articles titled, "How come there's an iPhone 6 but breast pumps are stuck in 1.0?" (Mitra Kalita 2014) As a media intervention, we were pleased that this particular angle came up so frequently. It begs the question, so often elided in the elite circles that produce the future, about *who innovation is for* in the first place.

(5) Noted Changes at MIT Media Lab Beyond the evaluations described above there are changes in perspective that we noted at the MIT Media Lab after the hackathon. Part of this is related to how the Lab accommodates pumping staff, faculty and students, particularly in a glass building that allows little in the way of privacy. Pumping women at the Lab had previously organized a temporary lactation space in the basement, however this space was reclaimed by a non-Media Lab group. HR is currently considering whether to buy a Mamava, a semi-portable lactation pod made by a company that came to their attention through the breast pump hackathon. In the meantime, new pumping moms at the Lab have taken an empowered attitude and re-purposed a sound room with the enthusiastic cooperation of the IT staff. While it's a work in progress, the internal attitude seems to have shifted from a couple years ago when a pumping mom papered over her transparent office window to pump in privacy and was told by her boss, a faculty member, that she couldn't do that. Likewise, we have noticed a definite shift in student attitude from when we initially began meeting to after the large hackathon. Initially, students, particularly those without children, perceived the topic as weird and possibly icky and unrelated to their work at the Lab. Through our powers of friendly persuasion, many volunteered at the hackathon nonetheless. And indeed, one group of students designated as volunteers were so inspired at

the hackathon that they turned into participants and developed their own prototype. This posed a slight problem for volunteer staffing but it was exciting to see Lab students so inspired. In other post-hackathon conversations, we have noticed that students have a different attitude towards breastfeeding and pumping. This might be partially because it was taken seriously by the press (who, we note, took it seriously because it was at MIT) and it was promoted internally by the Media Lab communications staff, the MIT student newspaper and the central MIT News office. Additionally, all of the organizers agree that we have started to see more babies in and around the lab after the hackathon, being cared for by moms and dads. Perhaps we have shifted lab culture to make it slightly more permissible to be a parent in addition to being a student.

Several internal staff supporters of the hackathon, including non-faculty instructors, have approached us with enthusiastic offers of support and networks to tap into. Where we have not noticed much in the way of shift is in faculty attitudes towards the project which remain disinterested except for a handful that have supported the project from its inception. This is somewhat understandable, since most faculty at the Media Lab are primarily interested in their own research and the social hierarchy of the Media Lab encourages faculty to see their students as their labor force. For example, one senior faculty member asked Ethan Zuckerman how he had "allowed" one of his graduate students to get pregnant. Somewhat shocked, he explained that he'd had nothing to do with her pregnancy. Similarly, as we organized the event, we were told by a faculty member that our work is not science and thus not worthy of research attention. We offered to do a 5-minute recap of the event for two research groups whose work relates to health and wellness and the faculty declined. After the hackathon, we were told by two (non-Media Lab) MIT faculty that it did not count as academic research. This makes it clear that while perspectives on the legitimacy of the issue may have shifted for some audiences, others, particularly those at the top of the academic food chain, remain unmoved. Notably, however, some faculty members are not having troubles pursuing patents for their students' pump innovations even though they might not agree that it constitutes a legitimate research topic.

Discussion

In this section we offer a discussion of the challenges and opportunities that we see arising from the "Make the Breast Pump Not Suck!" Hackathon as we see them applying to the design of hackathons for social impact more generally.

Counterbalance the pressure to disrupt, transform, and create anew. The celebratory, heroic and intense atmosphere of the hackathon lends itself to bold and creative thinking. For example, most of the teams at the breast pump hackathon took the title quite literally and took on redesigning the entire breast pump in various ways - to operate more like an infant, to use compression rather than suction or to be a smart, wearable system. On the one hand, speculative thinking outside of current constraints (market, manufacturing, social norms) is a desirable thing. On the other hand, the competitive pressure to develop something new and ambitious may prevent smaller, more feasible solutions—like one participant's noise muffling accessory—from being prototyped. Additionally, the atmosphere may also disincentivize teams from building on existing work because it may be seen as unoriginal. Hence the problem of hacks either unknowingly "reinventing the wheel" or coming up with false problems that do not necessarily need solving, such as measuring how much fat content is in the mother's breast milk. To mitigate this, we think it would be worthwhile to host events that explicitly set collective goals to further prior work such as code sprints in the open source software community or Wikipedia edit-a-thons ("Edit-a-thon" 2015). Another tactic in the absence of a collective project would be to experiment

with incentives to build on existing work, such as tying judging criteria or prizes explicitly to furthering prior research. The breast pump hackathon did not do this in relation to prior work but had success with creating incentives in relation to Human-Centered Design. We created a specific prize and asked judges to evaluate teams on how well they addressed the user ideas that were hanging on the wall. However, one thing to note is that requiring teams to extend prior work increases the responsibility of the hackathon organizers to provide some ways for participants to become educated in a short period of time, whether that is through handouts, exhibits, presentations or mentors who can guide them at early stages.

Hacking policy, culture and education in addition to technology. The breast pump is a sociotechnical design object which is to say that there is a complex web of histories, existing policies, social norms and technological factors that make it suck. For example, if the US had the year of family leave policy that other Western industrialized nations have, the urgency of solving the breast pump problem would be mitigated because parents could actually be with their baby during the first year of life. The same goes in a world where breastfeeding moms and trans-dads would have on-site daycare and could take breaks to nurse. In a global context, it's unclear that a breast pump (a device needing electricity and lots of water to clean properly) would be a good replacement for hand expression when mom is not with baby. So should we be educating more moms and families to manually express milk instead of innovating breast pumps?^[15] While we wanted to use the specificity of the breast pump design object as a starting point, we tried to orient participants around the whole ecosystem and to consider all of that territory fair game for hacking. Perhaps unsurprisingly, no team took on family leave policy, day care, education or social norms. We postulate that this is because the hackathon was at MIT and included a technologically-focused group of participants. Though we did have a ticket category for "Educators", we did not specifically work to get policy or program managers to the hackathon and the judging criteria was oriented around hardware prototypes rather than programmatic solutions or building political movements. We see potential for socially oriented hackathons to be much more expansive and creative than this in terms of the types of solutions, beyond the purely technological, that they incentivize. Again, however, it becomes clear that the team organizing the hackathon needs to carefully curate participant categories and message the hackathon properly to attract the people that are actively working in the areas of law, policy, education and media. These audiences may or may not identify with the "hacker" terminology (and perhaps they should not, for can one truly "hack" policy or is it a question of long, slow building of political will?). Finally, the question of how these projects get stewarded forward post-hackathon and integrated into real-world efforts becomes even more important.

Two Basic Systems: Development and Maintenance. The sourball of every revolution: after the revolution, who's going to pick up the garbage on Monday morning?

- Manifesto for Maintenance Art, Mierle Laderman Ukeles, 1969

Supporting, maintaining, nurturing and sustaining. Like most hackathon organizers, our team was focused on the production of the event itself. We were not fully prepared for the press attention the project received prior to the event nor for the way in which that led to interest from diverse, global audiences ranging from pumping moms to engineers to lactation consultants to researchers and

caregivers. On the one hand, we did have a way to direct interested pump users to submit their ideas for consideration at the hackathon. However, other people wrote to us from around the world wanting to connect, tell us about their work, or participate remotely in the hackathon. We tried to include and converse with as many of these people as possible but it was simply not possible to engage them all. After the hackathon, our community building work shifted to maintaining ties with those who reached out to us, supporting teams with forward momentum, cataloguing their accomplishments and connecting them with others. We were unprepared to be the central nodes in this newly produced network but this is what happened.

From this experience, we see potential for far more intentional design and consideration of pre- and post-hackathon communities. Here we would like to make a case for words like *supporting*, *maintaining*, *nurturing* and *sustaining* to enter the hackathon vocabulary. These actions constitute the work we named above as "context and community building" and run somewhat counter to the ethos of "making" (Chachra 2015). We had not planned this labor in advance but it became clear that the work of sourcing user ideas, cultivating trust with sponsors, institutions and scientists, connecting researchers with breast pump users, articulating problems to classes of students, matchmaking potential collaborators and documenting post-hackathon progress was not only nice but necessary to fulfill the original design goals of the hackathon. Our maintenance and support labor was all volunteer and unplanned and thus carried out in a somewhat ad-hoc manner amidst our other responsibilities. A more intentional design could include a 6-12 month ramp-up plan and ramp-down plan, with goals for how to gradually embed prototypes, projects and people into larger institutions and networks outside of the hackathon so that they would have a greater chance of success. Such a plan might also include (1) lightweight incentives for maintaining forward momentum. For example, we learned that MGH Global gives out a cash prize to the team who has made the most forward progress one month after their hackathon. And (2) deliberate ways, perhaps with social media or networked technologies, to enable lateral connections across the community produced by the hackathon without needing to go through the organizers. This could be as simple as producing a "Hackathon Directory", Facebook group or email list where participants can find each other in a structured way.

A note on labor. If all a hackathon needs is a space and some pizza, then one of its attractions is that it can be produced on the cheap and, indeed, has ended up as a low-cost pipeline for institutions to crowdsource product ideas, promote an API or recruit technical talent. We offer that if a hackathon aspires to have social impact beyond its weekend this assumption should be re-conceived. As Gregg and DiSalvo (2013) point out, the hackathon event itself creates a situation of precarious work conditions by harvesting the free labor of citizens. That is what also typically makes the hackathon inaccessible to groups who do not have the spare time and labor to donate to knowledge work because they are parenting or working for pay on the weekends. Additionally, the breast pump hackathon demonstrated to us the unexpected importance of "context and community building" as the crucial relational labor, conducted behind the scenes, that continues to glue the project together. As with most maintenance work, this kind of activity is often forgotten, overlooked and underpaid. We ourselves did not consider it in advance of it happening to us. As Mierle Laderman Ukeles states in her Manifesto for Maintenance Art, "Two Basic Systems: Development and Maintenance. The sourball of every revolution: after the revolution, who's going to pick up the garbage on Monday morning?" (Ukeles, 1969) While the revolutionary spirit of hackathons is PR-worthy for a weekend, the calculus of post-hackathon labor and criteria for success need recalibration.

Managing the Media Intervention and Public Conversation. In general, we were pleased with the quality and character of the media attention that the breast pump hackathon received. Partially, we see this as a result of carefully designing our event to stage exactly this kind of broader public conversation for interested parties that could not attend the actual event. We named it provocatively, determined talking points, designed our press materials and website to reflect those, prepared research to back up our claims, and listened to breast pump users and people who work in the field to adjust our messaging course. We tried to use language that was inclusive of everyone in the space, whether they were a mom, a dad, a gender variant parent, an exclusively pumping parent, a stay-at-home parent, a working parent, a NICU parent, or a low-income parent. We tried to foster discussion and model solidarity in our online community on Facebook. While not every socially oriented hackathon will generate high-profile media attention, it's important to consider the audiences that hear about the event through the media. The stories they receive are a site of intervention and a possible opportunity to shift their perspectives about an issue.

Conclusion

In this paper, we presented an in-depth case study of a single hackathon, the "Make the Breast Pump Not Suck!" Hackathon that attempted in its design to mitigate some of the common critiques leveled at social impact hackathons. These include problem-selection, diversity and inclusion issues around who participates, the exploitation of precarious labor, the lack of post-hackathon impact and positing purely technological solutions to sociotechnical issues.

While these critiques are significant and warranted in many cases, the authors' experience organizing the breast pump hackathon lead us to believe that the hackathon form can be viable. Stewarding forward the post-hackathon energy, projects, and community is key. Specifically, we encourage hackathon organizers to design for inclusion, to counterbalance the focus on disruptive technology with emphasis on extending existing work and small efforts, to hack areas such as policy, culture and education in addition to technology and to consider the media as an opportunity to instigate a larger public conversation. With these re-designs and a careful crafting of the hackathon's timeline, organizers can take into account the labor of nurturing and sustaining a community.

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[1] <http://water.worldbank.org/node/84165>

[2] <http://15iacc.org/get-involved/iacc-hackathon/>

[3] <http://www.hackathonwatch.com/h/the-international-development-hackathon-2014>

[4] <http://hackforchange.org/>

[5] <http://rhok.org>, <http://gwob.org>, <http://socialcoding4good.org>

[6] Though perhaps we should not have been so surprised since this is arguably what early hackathons were about - providing a space for open source communities to come together, build solidarity and community identity and further existing projects.

[7] Throughout this paper we use the terms "mom" and "mother" expansively to include all gender-variant lactating parents.

[8] The organizing group was Tal Achituv, Catherine D'Ignazio, Alexis Hope, Taylor Levy, Alexandra Metral, David Raymond and Che-Wei Wang with the advisory support of Willow Brugh and Ethan Zuckerman.

[9] The C4CM is jointly run by the Media Lab and the Comparative Media Studies programs at MIT. The C4CM focuses on technologies and processes for civic engagement, media production, and media analysis, with a strong focus on participatory design methods for involving communities who will ultimately use technologies in the design process.

[10] Manufacturers state that breast pumps should not be handed down to others for "hygienic reasons" which is wasteful, particularly when there are many women who cannot afford to purchase a brand-new breast pump and/or who do not have insurance.

[11] <https://soundcloud.com/bbc-world-service/newshour-hacking-the-breast-pump-at-mit>

[12] <https://www.facebook.com/NPR/posts/10152864553696756>

[13] <https://twitter.com/search?f=realtime&q=mit%20breastpump%20&src=typd>

[14] https://www.facebook.com/NPR/posts/10152864553696756?comment_id=10152864580156756&offset=0&total_comments=305

[15] As one mom wrote us regarding manual expression: "It's free, easy, requires less washing and is totally portable. I want to teach other moms how simple it is and what a revelation it's been."