



Constructing and constraining participation in participatory arts and HCI



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ARTICLE INFO

Article history:

Received 2 September 2013

Received in revised form

1 October 2014

Accepted 11 October 2014

Available online 23 October 2014

Keywords:

Participatory art practices

Social practice art

Sustainable HCI

Spectacle

Heirloom computing

Citizen science

Participation

ABSTRACT

Social practice art may suggest new understandings of and strategies for participation in HCI—but not in a straightforward way. Based on participant-observation at a major arts festival, we describe how a set of artists, concerned with environmental issues and community engagement, frame and enact participation, and describe how the nature of this participation deviated from both artists' and our ideas of what participation would be. We delineate how the disciplinary context of art both enables and limits the kinds of participation that can be achieved. We characterize 3 strategies these artists use to achieve participation: participation in spectacle, participation in making, and participation in inquiry. We develop the implications of this work to inform HCI through three case studies related to sustainability – spectacle computing, heirloom computing, and citizen science – to demonstrate the potential for similar strategies for participation and to call attention to how HCI, too, implicitly constructs, enables, and constrains participation.

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1. Introduction

The arts are an important source of inspiration to expand human–computer interaction (HCI), because the different practices of artists can help us to see new opportunities for design and engagement that a purely technical approach may obscure (DiSalvo et al., 2009). This paper contributes an empirical qualitative study of a set of contemporary participatory art projects that engaged issues related to “sustainability,” broadly construed. Our original interest in these artists stemmed from the interest in sustainable HCI for deepening modes of participation in what has been until now a fairly designer-driven field (Brynjarsdóttir et al., 2012; DiSalvo et al., 2010; Dourish, 2010). However, in practice we found that participation in social practice arts was substantially different than we had anticipated or the artists had described, leading to deeper issues in and broader implications for this work. In this paper we analyze how participation is both constructed and constrained in these arts projects and identify three modes of participation. We then explain how the patterns of constructing and constraining participation map to and could inform HCI research, and apply that typology to three themes in sustainable

HCI research to demonstrate how lessons from this work can inform future HCI research.

As the basis of this research we conducted fieldwork at O15J Biennial: a major international media arts festival with an emphasis on collaborative approaches to art. Our fieldwork included observation and analysis of presented works and their audience reception, participation as a commissioned collective in the festival, and follow-on interviews with artists and the festival staff. Based on our collected data, we analyze the strategies these artists use to address participation in their work, how those strategies play out experientially, and the structural and disciplinary conditions that enable and limit participation with the created works. Far from providing a simple set of readily available methods for collaborative and participatory engagement, what we discovered through our ethnographic work is that these art practices were themselves constrained and problematic. Although they all strove to reframe understandings of how technology might be designed to contribute to new social forms committed to sustainability, they also struggled with issues of audience, intentions, and expectations. We use this analysis to suggest specific ways that HCI, and in particular sustainable HCI, may be able – or not able – to take inspiration, strategies and tactics from the arts in developing new research programs, artifacts, and systems. These insights are certainly not exhaustive of the possibilities of the arts, but they do provide a tractable set of themes for HCI researchers and practitioners to draw on. Our position, as

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authors of this paper, is as HCI researchers. As with any ethnographic or participatory design project, there are multiple ways to frame and present the analysis; for example, DiSalvo et al. (2011) have published elsewhere on elements of this work from a co-design point of view. In what follows we discuss this project specifically from the perspective of sustainable HCI specifically and HCI research more generally.

We begin by recounting our entry point into the topic, providing a brief background to the arts in HCI, in sustainable HCI and in Participatory Design, and describing our field site and methods. Based on a description of three projects selected to demonstrate the range of strategies and outcomes we saw at the festival, we analyze how participation was both enacted and constrained at the festival. We draw out three modes of participation engaged by artists: participation in spectacle, participation in making, and participation in inquiry. We then apply these three modes of participation to three themes in contemporary sustainable HCI: spectacle computing, heirloom making, and citizen science, in order to draw out both possibilities for new HCI practices and highlight potential conditions that might in fact constrain, rather than enable, participation for our field.

2. Background

2.1. Participation and sustainable HCI

Our starting point for this work was grounded in existing critiques of how designer–user relationships were characterized within sustainable HCI work. In prior work we had found that the preponderance of publications in sustainable HCI construed ‘sustainability’ as a problem that is identified by designers and solved by technology (DiSalvo et al., 2010). For example, a typical sustainable HCI paper might describe a system that is intended to reduce electricity consumption by tracking when users leave appliances on and idle, and sending reminders to a user’s smartphone to turn the appliances off. In many cases, the choice of problem (e.g., resource consumption), cause of problem (e.g., unnecessary use of idle mode), and its solution (e.g., telling users to turn appliances off) would likely be selected by designers with little input from end users. Indeed, with the exception of the subareas of formative studies (ethnographic studies of end users) and participatory sensing (people collecting data to contribute to understanding of environmental issues), most sustainable HCI work framed user practices, knowledge, and attitudes as the problem to be solved rather than, as in participatory design, a resource to inspire solutions.

Other critiques of the area pointed to similar issues. For example, Dourish (2010) argues that design imagination in sustainable HCI tended to focus on altering individual action, at the cost of addressing the roles of other stakeholders or imagining other ways in which collectives could come together to address problems of sustainability. Strengers (2008) and Woodruff et al. (2008) argue that rather than designing sustainability solutions from the point of view of experts, we should find ways to help users themselves become experts on sustainability on their own terms. Overall, we and others found that the preponderance of work in sustainable HCI frames users as individual consumers whose behavior needs to change in ways designers are uniquely authorized to identify. This framing runs directly counter to the designer–user relationship suggested by participatory models, in which designers, users, and other stakeholders would be engaged in co-defining the problem to be solved and in imagining new solutions (Namioka and Rao, 1996). We ask, why is this so?

One reason is that nearly half of the sustainable HCI literature at the time we began was grounded in BJ Fogg’s model of persuasive

computing (Fogg et al., 2003). The goal of persuasive computing is per definition to persuade users to achieve a particular goal selected by the designer. Fogg sees designers as ultimately responsible for deciding what behavior changes should happen and how behavior change should be triggered. It is possible to do persuasive computing in a participatory manner (e.g., Davis, 2009), but given its problem framing it is not particularly likely; in a survey of persuasive sustainability, we found that 3 of 36 papers published in the prior two years had a participatory orientation (Brynjarsdóttir et al., 2012).

A second reason is grounded in the nature of sustainability and the ways we in HCI understands it as a social problem. Sustainability is a problem understood as caused by human behavior, which, as Dourish (2010) argues is framed as a moral problem—i.e., if only people would consume less, then sustainability might not be such a problem. This means addressing sustainability with technology requires us to change user’s behavior, perhaps in ways that they don’t want to. And the societal problem is seen as so urgent that users *must* change whether or not they want to.

Yet there were also intriguing signs of a need for and benefits of taking a participatory approach. Strengers (2008) demonstrated how mismatches between user practices and values and the assumptions of smart metering systems led to breakdowns in their effectiveness. Hirsch and Anderson (2010) also demonstrated the value of working with participants to debate different perspectives on what counts as ‘sustainable’ rather than establishing a single designer-led definition. Inspired by this work, in this project we aimed to discover alternative design spaces that could be opened up by imagining participation in sustainable HCI in new ways. There are many ways to approach this problem. One could be to turn to participatory design for guidance; indeed, this is already being done (e.g., Davis, 2009; Bonanni et al., 2010; Heitlinger et al., 2013). We chose another route. In this work, we looked to social practice art to find new ways to conceive of the respective roles of technologies, their creators, and their users. In the next section, we explain why.

2.2. The arts and HCI

Over the past several years the role of the arts in HCI has taken a turn from emphasizing objects of art to an increased attention to the practices of art (DiSalvo et al., 2009; Jennings et al., 2006; Light et al., 2009; Salter and Wei, 2005). For example, many researchers have explored the ways in which the practices of performance might serve as both sites of HCI research (Benford et al., 2011; Reeves et al., 2005) and inspiration toward the design of new interactions and experience with technology (Benford and Giannachi, 2012; Dix et al., 2006). More generally, researchers have drawn upon the arts for inspiration in methods of invention. Perhaps the most well-known example are cultural probes, which draw from a variety of art games and framing practices to elicit responses that serve as inspiration for designers (Gaver and Dunne, 1999). Within HCI research, then, it is fair to say that the arts have become established as a site of productive exchange as both more artists and scholars with backgrounds disciplines concerned with the arts have begun participating in HCI, and more HCI researchers from fields such as computer science, social science, and design, have begun to draw from arts practices and theories to shape their projects. This is not without its problems, but it does signal a broadening of the field of HCI.

Our work draws from and contributes to work in the domain of sustainable HCI that has likewise looked to the arts. For instance DiSalvo et al. (2009) has analyzed the work of eco-artists in order to draw out themes and tactics that might be beneficial to sustainable HCI designers and researchers. Whereas much of the arts-oriented work in sustainable HCI has examined artifacts or systems, here we set out to conduct an empirical study of projects

as they occur. We are not the only researchers to do so. For example, [Jacobs et al. \(2013\)](#) has developed a series of art-based research projects and experiences that work to re-frame relations between people and the environment, and she has studied and reported upon this work in the context of HCI. This and related work [Holmes \(2007\)](#), [England \(2012\)](#), [Fantauzzacoffin et al. \(2012\)](#), [Leong et al. \(2011\)](#), demonstrates an increasing depth of encounter between the arts and HCI broadly (not limited to sustainable HCI). Similarly Participatory Design (PD) has increasingly been influenced by the arts. Within PD, design researchers have drawn from arts practices to frame and structure collaborative and open approaches to public engagement with technology, often in the context of contentious issues ([Ehn, 2008](#); [Muller and Loke, 2010](#); [Muller et al., 2006](#)).

These process and method oriented arts-inspired approaches in HCI and PD can be understood as a corollary to so-called social practice art. Social practice is a term used to describe a cluster of contemporary art in which the artist engages with the public in the production of the work—i.e., the work is co-constituted by the artist and the public in a direct manner. It is important to recognize and appreciate that the social practice refers to a broad corpus of work, theory, and criticism and within this corpus there are distinctions and disputes. Put another way, social practice should be understood as referring to pluralistic multiplicity of practices and perspectives, including, but not limited too, relational aesthetics ([Bourriaud et al., 2002](#)), dialogical aesthetics ([Kester, 2004](#)), and new genre public art ([Lacy, 1995](#)). Within social practice, broadly construed, participation and positionality are key concerns and topics of debate. For instance, one way to interpret differences between relational aesthetics and dialogical aesthetics could be in regards to how the artist and the art work is positioned in relationship to the museum and the art world. The character of participation is also a significant topic of debate. This is exemplified in exchanges between the theorists Grant Kester and Claire Bishop on the role of agonism, or contention, in dialogic aesthetics ([Bishop, 2004](#); [Wilson, 2007](#)). Bishop has further explored the tensions between participation and spectatorship in contemporary art, problematizing many of the claims and assumptions of social practice art ([Bishop, 2012](#)). Social practice, then, provides a particularly useful point of exchange between HCI and the arts, precisely because many of the issues and purported potentials of participation that are present in contemporary HCI research have been present in social practice work and theory. We believe social practice can be a practice that we, as HCI researchers, can learn from, and perhaps through collaboration, learn together with. One purpose of this article is to contribute to this learning.

The social practice artists featured in the following case study all share a concern with sustainability, in a broad and complicated sense. While not all social practice art is concerned with sustainability, most is concerned with social, political, or cultural issues, and the ways in which we might imagine and act differently with regard to those issues. As such, social practice art is an appropriate form and practice to examine when considering how HCI might draw from the arts to engage in similarly issue-based work. This article is certainly not the first to make this connection, explicitly or implicitly, but adds to work in HCI and PD including those of [Clarke et al. \(2013, 2014\)](#), [Blythe et al. \(2010\)](#), [DiSalvo et al. \(2009\)](#), [Light et al. \(2009\)](#) and [Wright and McCarthy \(2010\)](#). Each of these projects is different in scope and purpose, but they share a commitment to exploring the role of arts-informed HCI research similar to social practice in terms of how engagement between the researchers and the audiences or publics is characterized. For instance, as a component of the Democratizing Technology project Light and colleagues employed arts methods to work together with a group of elders to explore possible energy scenarios. Clarke and colleagues and Blythe and colleagues both used arts methods in

contexts of care, and while the methods and contexts are importantly different, we can appreciate a commonality in the how the engagements were structured to use creative expression and inquiry as conjoint activity between the researchers and the publics they were engaging. Our engagement with social practice in this research then is not the first of its kind in HCI, but rather attempts to contribute to a growing conversation around social practice and socially engaged art in/as HCI research ([Clarke et al. 2014](#)).

2.3. Field site: 01SJ, the Garage

As a contained fieldsite for explorations of participation in social practice art, we selected 01SJ, the largest and most prestigious media arts festival in North America. It originally focused on new media (art using technology), and has developed into a festival that strives to explore and present the creative and critical use of technology (broadly construed) in society. For the 2010 01SJ, the curators developed a series of exhibition programs, one of which was The Garage ([Fig. 1](#)). This program was the most open-ended compared to the rest of the festival programs; its explicit purpose was to explore open, experimental, and participatory approaches to technology use and development. A curatorial statement on the 01SJ webpage ([Dietz, 2010](#)) describes 01SJ's aim to be an “innovative platform [building] on the dynamic histories of Garage hacking and citizen science to build not just what's next but to imagine how what's next matters” ([Fig. 2](#)).

There were two overarching themes for 01SJ. First, the concept of Do-It-Yourself (DIY) intended to connect the art and technology exhibited in the The Garage to the local history of the Silicon Valley with a nod to the humble beginnings of technology giants such as Hewlett Packard and Apple. The thematic DIY direction was also chosen to demystify the new media process for the general audience, inviting them as participants into the creation of new media art. Second was the charge to ‘build your own world,’ i.e., for audience members to literally take active part in making their neighborhood or community a better place. The aim was to create an experience where audience members could participate in a hands-on way in workshops, building and experimenting with technology alongside the artists; for example, the curatorial statement advertises not static artworks but “projects [that] will be ‘in process’ and open for public viewing.” The workshops in The Garage mostly took place the week before the actual festival weekend of September 16–19, 2010, although some continued through the weekend.



Fig. 1. The Garage was housed in a large convention and trade-show building in downtown San Jose. This image depicts several of the installations at the start of the day, before visitors arrive.

2010 01SJ BIENNIAL

BUILD YOUR OWN WORLD

SEPTEMBER 16–19, 2010
SAN JOSE, CA

01SJ produced by ZER01

PROGRAMS · ART · ATTEND · SUPPORT · BLOG · PRESS ROOM · HISTORY

ARTISTS · ARTWORKS & INSTALLATIONS · EXHIBITIONS · OUT OF THE GARAGE · VENUES

OUT OF THE GARAGE INTO THE WORLD

ZER01 is inviting independent artists, designers, architects, engineers, programmers, and corporate and academic research programs to publicly work in San Jose's 80,000 square foot [South Hall](#) to create projects for exhibition, performance, provocation, and interaction. From September 4-14, these projects will be "in process" and open for public viewing. The results will be presented and exhibited, both in South Hall and in other parts of the City, September 16-19. An overview of *Out of the Garage Into the World* is [here](#). Individual projects are listed below.

One of the programs of *Out of the Garage Into the World*, *Empire Drive-In*, will become the venue for the [Future Films](#) program. There will also be [artist talks](#) in South Hall during the Biennial and a closing party/meal from the [Tomato Quintet](#) project on Sunday.

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Adobe Youth Voices | 01SJ: Visions of the Future Workshops [DETAILS >](#)
[Adobe Youth Voices](#)
 In collaboration with Adobe Youth Voices, the Adobe Foundation's global youth media initiative(link), workshops will be held during the 01SJ Biennial from September 6th -14th at computer labs in South Hall as part of *Out of the Garage into the World*, and taught by leading artists and professionals in the field.

All Raise this Barn, West [DETAILS >](#)
[MTAA](#)

Fig. 2. Promotional page for 01SJ (Dietz, 2010).

3. Methods

We selected The Garage at 01SJ as a case study to understand participation in the social practice art engaged with the environment sustainability. We did this because, as researchers and artists, we shared a common interest with a large portion of the works presented there in developing alternative, collaborative, DIY and dialogic approaches to address environmental issues. Specifically, we chose artists who were working with themes related to sustainability and that engaged technology as part of their artistic practice. This made the work generally comparable to work in sustainable HCI, in that the artists were choosing to use and/or engage the issues of technology in relation to the desires of sustainability. Certainly there are many social practice artists who engage issues of sustainability not through or with technology. This work is also important, but it was outside of the scope of this study. By choosing artists engaging technology our hope was to find more direct connections between HCI and social practice art through the shared technical medium and practice. Our methodology was a mixed-method approach that combined audience observation, participant-observation and interviews to capture the variety of projects and practices at the festival. Much of our attention was on the artists themselves, as we were particularly interested in how they framed their work conceptually and the relationship between that framing and the experience of the work in action.

Our data collection was done by two research teams using coordinated, complementary methods. One team of researchers prepared for and attended the festival as the group growBot Garden, artist-presenters of publicly available workshops for festival attendees in The Garage. Disciplinarily, this team identified primarily as media artists and designers, with an additional interest in HCI. As researcher-participants, the growBot Garden team members chronicled their day-to-day experiences through field notes, reflecting for instance on the festival itself, workshop interactions and events that stood out each day during the week leading up to the 01SJ weekend and the festival weekend proper. The second team of researchers prepared for and attended 01SJ as

audience members, observing the festival at The Garage, participating in workshops and activities presented by artists, chronicling experiences and conducting brief in-situ interviews with artists and audience members at the festival. This team had its primarily disciplinary home in HCI, with a track record of interaction with the arts. Because this second team was not directly involved in any of the planning or production of the growBot Garden project, or any other project at the festival, their experiences were, primarily, as audience members to the various artists projects.

The two teams then collaboratively analyzed our data in an iterative fashion following the initial field-visit in San Jose in 2010. First, based on the grounded theory approach as presented by Charmaz (2006), we read in detail and then did open coding of the fieldnotes and in-situ interview transcripts. After our initial analysis identified key themes and open questions, in spring 2011 we prepared and executed post-mortem interviews with five of the artists that had presented at The Garage. Finally, after transcribing the post-mortem interviews, we extracted concepts and issues that through further reading and coding evolved into the themes that we present here. To supplement our data analysis, we relied on our own photo-documentation as well as publicly available advertising materials for 01SJ (brochures, on-line content, and flyers handed out at the festival).

4. The chimera of participation

The analysis we present in this paper arises from a core challenge that arose while processing our fieldwork data. We went to the festival originally to learn how to deepen participation in issues around sustainability from social practice artists. When we returned from the festival, we discovered a schism in how our groups evaluated the festival. Broadly speaking, the research team that had been participant-observers, who had a stronger background in social practice art, felt that despite logistical issues and an understandable range of evaluations of the other artistic interventions, the festival overall was a reasonable success. The research team that had been audience observers, who were less familiar with social practice art,

returned disillusioned. They had begun the study with the hope of deriving insights for HCI from the techniques and orientations of the artists about how to enhance participation with regards to sustainability. They expected, in retrospect naively, that artists knew how to engage audience members in an equal playing field in imagining and working toward sustainable futures, and they would be able to identify strategies and orientations identified at O1SJ to expand sustainable HCI's imagination of designing with citizens, and not only for consumers. Yet they felt that what they had learned was only what not to do. This team felt that there was a contradiction between the artists' professed interest in participation and the apparent reality of non-participation on the ground.

The participant team in turn felt that this sense of disillusionment derived from misunderstanding the nature and expectations of social practice art, and that highlighting the challenges misdirected attention from lessons about strategies and techniques that would be useful for HCI. The audience team then wondered if the participants' views were based on a better understanding of art, or were a symptom of the participants having "gone native." That is, the audience team wondered if the participants' views reflected the participants' desires to claim a successful engagement, and thereby set different standards for, or expectations of, participation in the events.

This was not the first time our teams had worked together, but it was the first time in our work history that we had such a serious difference of opinion. This disagreement led to several heated discussions during the course of analysis and write-up, and to some degree has never been resolved. Yet this disagreement did not block analysis; instead, it was generative, in two ways. First, it raised issues that demanded resolution—why is it that participation can look like it is there to "insiders" but not to "outsiders?" What does this mean about the nature of participation and how it is enacted on the ground? Second, it forced us to seek other avenues of agreement. What lessons about participation, how it is constructed, and how it is constrained could we agree on, even if the ultimate evaluation of success might remain different between our two groups?

Here, we describe the results. We begin with a description of three projects chosen from the broader set of projects observed to be emblematic of the kinds of strategies and outcomes we saw at the festival. For each project, we describe the concept of the project, including how the artists envisioned participation happening, and in what ways and to what degree participation actually appeared or did not appear to happen on the ground. The first two projects are written up largely by the 'outsider' team (the audience participants). The last project, growBot garden, was written up by the 'outsiders' drawing heavily on fieldnotes and descriptions provided by the growBot participants ('insiders'). Overall, in our description, we aim to do justice to both teams' point of view by describing both significant problems we observed and successes, full or partial, as identified by the researchers or as described by the artists themselves. We then discuss how these case studies reveal how participation works – and does not work – in these social art practices. In the section to follow, we will explore how this analysis might be extended into HCI to highlight opportunities, as well as potential issues, to addressing participation.

5. Case studies

5.1. Case study: xAirport

The xAirport project was conceived by artist Jeremijenko (2014) as a way to highlight environmental issues related to the commercial flight industry and propose an alternative, speculative form of environmentally friendly flight. Creatively extrapolating trends in the development of single person aircraft, Jeremijenko

designed a personal flight technology comprised of a pair of human-sized wings attached to a zip-line. The zip-line flight path spanned an artificially constructed marsh ending in a small wetland. In Jeremijenko's concept, the development of such individual flight technology contributes to ecological restoration by giving wetlands an instrumental use to enable safe human landing. Jeremijenko's xAirport, then, was designed to enable participants to experience a prototype class of flight that imagines an alternative relationship between flight technology and natural spaces, packaged into a personal experience intended to be empowering, exploratory, and embodied.

5.2. Envisioned participation

Jeremijenko designed xAirport as a multi-staged participatory project in which a person would sign up for flight-training school and then go through a series of educational and reflective activities before joining the Imaginary Airforce as a pilot. For instance, in one stage the participants would experiment with mock-flying with different types of wings (laser-cut from cardboard) to experience different aerodynamics. After completing flight training, participants would receive a set of laser-cut wings and then conduct a test flight using the zip-line and full-human-sized wings.

5.3. Participation on the ground

The xAirport installation at The Garage was prominently placed and consisted of two parts: an indoor instruction and experimentation area and an outside area with the zip-line, which mostly featured a pair of human-sized silver colored pilot-wings swaying gently in the breeze (Fig. 3). The inside area had a public section with instruction stations and a private section holding extra supplies and tables, separated by transparent plastic streamers. Unlike the calm sway of the pilot-wings outside, inside it was a hectic, as people would wander through the area in a seemingly random fashion, trying to make sense of the installation. There were usually one or two people in the private back area, who were members of or related to Jeremijenko's team; on occasion, Jeremijenko was in the public area, talking with the audience and the media.

Attendees did engage with the installation, browsing the space, inspecting informational materials and props, such as the cardboard wings, chatting briefly with Jeremijenko or others in the space. However, we did not witness or know of any participant who walked through all of the stages to become a member of the Imaginary Airforce at The Garage. Display numbers identifying each activity station were quickly knocked to the ground, making



Fig. 3. The xAirport zip-line as generally seen at the festival.

it unlikely that attendees would understand the intended order of activities. Attendees seemed unaware of, or unwilling to engage in, the intended process and instead would look around briefly, grab a pair of cardboard wings located near the main exhibit walkway, and continue walking. There was little interaction between audience and artists, as the indoor area of xAirport was sparsely manned; we frequently observed Jeremijenko being interviewed by the media or troubleshooting zip-line issues with her assistants.

One of the challenges for xAirport was that the lure of the zip-line may have overshadowed what Jeremijenko was trying to accomplish. As Jeremijenko described in a later interview, there was a gap between what she believed the audience wanted to do – ride the zip-line and take home free design artifacts like cardboard wings and a temporary tattoo – and her vision of xAirport as inviting festival guests to engage in a dialogue about the airline industry, environmental considerations related to airport design and aerodynamic factors that could reshape air transport from mass to individual transport. Seeing participants walk up, take a pair of cardboard wings, and walk away was no doubt frustrating for Jeremijenko. This is not to say that the audience members were not capable of engaging in such a conversation, but rather that the context in which the installation was presented at The Garage seemed unsuited to support the type of audience experience envisioned in the design of the project, which required attention in order to engage in performing this envisioned future.

Indeed, the outside installation of the xAirport was visually arresting—a zip-line, a pair of silver human-sized wings, a marsh constructed on top of a parking lot. Perhaps it is no surprise that attendees were immediately attracted to the work, gathering around outside to see if it would work, to vicariously partake in the visceral experience of flight. During scheduled times, participants lined up to zip-line and were given an overview of both the concept and the basics of zip-line flight before being released to fly from one end of the installation's constructed marsh to the other. In an interview with members of both teams, Jeremijenko stated that the project was not designed to be an “instant and immediate one-liner piece” (April 8, 2011). But the arresting visual of the zip-line and marsh, together with the social structure and expectations of the festival visitors, may have thwarted the engagement and consideration that Jeremijenko intended. Compared with the potential of soaring 30 feet over an artificial marsh on a pair of silver wings, the idea of learning about aerodynamics, the future of flight, and the ecological values of wetlands may pale in comparison. And even as a spectacle, xAirport was competing with many other spectacles at The Garage, which would make it difficult to engage spectators' long-term attention.

Nevertheless, for Jeremijenko xAirport was successful in two significant ways. First, the fact that xAirport was one of the more media-documented pieces at the festival is both a short- and a long-term indicator of success for the artist, as this exposes Jeremijenko's work not only to audiences but also to current and future potential backers or curators. Being able to attract the attention of media, funders, and curators is essential for a high-profile artist like Jeremijenko, who projects a memorable image:

As other artists were just beginning to unpack their computers and hammers Sunday at the 01 techno-art festival in San Jose, Natalie Jeremijenko was way ahead of most of them. Wearing a pair of inline-skates and a cowboy hat, the Australian artist grabbed a pair of Styrofoam wings and skated up and down to mimic a 21st-century Icarus (Anon, 2010).

Second, and more fundamentally, from her point of view as an artist and an instigator, the installation attracted the attention, and perhaps the imagination, of a number of festival goers. As Jeremijenko puts it (April 8, 2011):

In San Jose, what you can do with a big, public event is a spectacle with people... [Getting people excited] about the possibility of radically changing urban mobility. That's the sort of thing that I want

to achieve. I am not gonna get any academic papers out of it, and I don't want that [laughs]... Whether they maintain the central concept of [aerodynamics] and all the kind of inane validation techniques, that's not how you inspire cultural and social change, you inspire people by having people say 'Oh, that's cool!'...Was it successful in having people say 'Oh, wow, that's cool'? Yes. There were plenty of people that got it.

Framed this way, from Jeremijenko's point of view the ultimate success for the regular festival goer was not about their literal participation in riding the zip-line. Rather, the goal was to give the festival goer the opportunity to experience herself as someone with a valid and legitimate contribution to the conversation about airplane design. Allowing the festival goer to try for themselves what personal flight could feel like with the aid of cardboard wings was thus framed as an opportunity to start a conversation, to plant a seed for social and cultural change.

5.4. Case study: Eyebeam, Andraos and fluxxlab/personal powerPlant

personal powerPlant is a DIY kit developed by Mouna Andraos and the artist collaborative fluxxlab (Jenny Broutin and Carmen Trudell) to build a hand-cranked device for powering portable electronic devices (Anon, 2013). At The Garage, as part of the media arts organization Eyebeam's schedule of events, the artists planned a daily 5-h workshop over the festival weekend to introduce basic electrical circuits and allow participants to construct their own personal powerPlant. The workshop was designed to be thorough and participatory, entailing an introduction to electronics and electricity, a discussion of the practices of and issues in energy harvesting, and then the construction of individual hand-cranked personal power generators from supplies provided by the artists. Participants would meet with the artists at designated times, and then spend the afternoon working together with the artists, in a mix of dialogue of making—listening, asking questions, discussing, debating, fiddling with electronics and constructing their own personal powerPlant.

5.5. Envisioned participation

In a follow-on interview describing the workshop, both Broutin and Trudell stressed that the focus was not simply on sustainability but on getting people involved in making and building:

...we are always trying make things in order to solve problems... So while we do make these projects that engage with energy, a huge part of the way that project is designed is to make that transparent and accessible and *engageable* for ourselves at the baseline and then what we learned through the process, we sort of open up to other people and hope they take it even further than we had first envisioned in the project. (March 26, 2011).

The envisioned participation was therefore pedagogical, with the goal of engaging individuals in reflective construction and empowering them with this new knowledge. In order to participate, people would sign up in advance on The Garage website and dedicate an afternoon to attending, building a personal powerPlant kit (Fig. 4), and discussing what Eyebeam materials described as ‘sustainable energy harvesting.’

5.6. Participation on the ground

As Broutin and Trudell reported in a follow-up interview, a main challenge for the personal powerPlant workshop was a lack of participants. People did sign up in advance to attend the workshop, but there were too few participants to offer it daily.

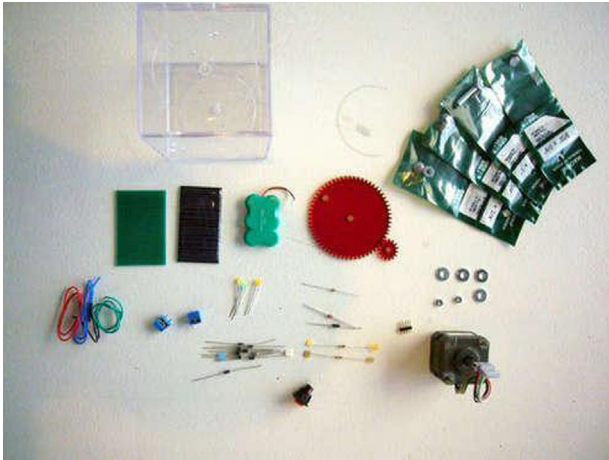


Fig. 4. Personal powerPlant components before assembly. Image credit: (<http://www.instructables.com/id/personal-powerPlant/>).



Fig. 5. Workshop activities in the Eyebeam workshop area.

From the perspective of the workshop participant, a low participant-to-artist ratio is not necessarily a problem, especially when the objective – to make a small but functional electronic charger – may be new and challenging. Having few other participants allows for more individual attention and feedback from the workshop facilitators. Participation becomes more intimate with the potential for a closer connection and more robust exchange between artists and participants. But fewer participants also meant fewer opportunities for feedback on the kit they developed for the workshop – one of their main goals – and for engaging with participants in a conversation about sustainable energy harvesting.

A lack of participants seemed to be an issue for all the Eyebeam workshops (Fig. 5), according to Stephanie Pereira, Associate Director of Learning and Engagement at Eyebeam at the time the festival took place.

In the lead up period to this festival [pause]—something that was really a big downer was, ummm, people weren't just coming through [the workshops]. And when we were talking about it afterwards we realized that we were kind of trusting in the festival to organize that for us, because we were kind of parachuting in to a foreign environment, we didn't know anybody in the area.

In retrospect, Pereira saw this reliance on the festival to engage participants as a mistake; in the future, they would engage local strategic partners who could draw on local networks:

[I]f we do this again... we would design the program in partnership with a [local] school rather than design the program and partnership with people from New York and bring it hoping to find engagement. We would design for engagement from the outset. (Stephanie Pereira, May 24, 2011).

When workshops were not running, Broutin and Trudell used the time to work on the personal powerPlant themselves. In a sense, in the absence of outside participants Broutin and Trudell enacted the very participation they were hoping for: they continued to engage in the reflective construction of the device, using lessons learned to iterate on both the design of the device and the workshop content. This included experimenting with different ways to build the circuitry in the personal powerPlant and different ways to talk about and explain the kit. They thus describe their Garage experience as successful for them; having this time to tinker meant that the next installment of the workshop, which took place the following January, had been refined to make the overall workshop experience run more smoothly.

5.7. Case study: growBot garden/speculative designs for speculative agricultures

The growBot Garden group (comprised of Thomas Barnwell, Laura Fries, Thomas Lodato, Beth Schechter, and Carl DiSalvo) attended O1SJ as presenting artists and as participant observers for our research. Formed out of a design research studio, growBot Garden combined methods from design and social practice art to explore the design and use of technologies for small-scale agricultures, billing themselves as “Speculative Designs for Speculative Agricultures.” By explicitly characterizing the work as “speculative design” the growBot Garden group was making connections to a tradition of design practice that makes representations of imagined futures or alternate presents as a way of drawing attention to the possible social implications of technology development (Auger, 2013; Lukens and DiSalvo 2011; Dunne and Raby, 2013). For the festival, growBot Garden developed four workshops, each coupling an agricultural and technological theme: Food Are Here (mobile maps for foraging), Autonomous Systems for Remote Agriculture (seed-bombing robot balloons), Sheep's Clothing (sensor networks for mushroom hunting), and Cheese Computing (conceptual prototypes of cultivated circuitry/hardware). Each workshop was led by a different group member and was intended to combine activity and reflection toward the development of prototype products and systems.

5.8. Envisioned participation

Similarly to other participating artists in The Garage, growBot Garden offered a series of workshops over the span of the festival. The workshops were generally planned as 1–2 h events that would often begin in The Garage but then continue in downtown San Jose. So, for example, Sheep's Clothing would begin with a discussion of mushroom hunting, bringing together the participants with the artists and designers to outline the conditions and issues of mushroom hunting in the city. Participants would then proceed out into the city to hunt for mushrooms with members of the growBot Garden team. This hunt could be as short as 20 min to as long as an hour, depending on the interest of the participants. After the hunt all would return together to The Garage to collaborate on designing sensing technologies to support the just-experienced practices of mushroom hunting.

Expressive of an open approach to participation, participants were involved in deciding what specifically to address for their particular workshop, setting the stage for speculative exploration and active participation. In chronicling their experiences, the theme of desire to meet the audience member at their level was central for growBot Garden team members. For example, the team would shift their schedule to fit around potential participants' schedules.

5.9. Participation on the ground

The growBot Garden area was consistently busy with festival visitors throughout the weekend of the festival. This did not translate into a large number of workshop participants, however. In the week before the festival, there tended to be around five to eight workshop participants, except for a large group of eighteen children and seven adult chaperones one day. The trend of many visitors, but with only a handful joining a workshop, continued throughout the weekend. Being among the first stops at The Garage meant that audience members were 'fresh' and ready to engage in a way that inevitably would be harder as fatigue sets in. On the flip side, being the first of many interesting projects to look at, visitors were not necessarily ready to commit to a lengthy engagement. One growBot Garden team member¹ recalls:

... About 10 or so minutes into the presentation, two young women walked up. We told them what we were doing, invited them to sit, and they did. [Another growBot member] finished his presentation, and then we all got to talking. That's when we found out that one of the women was a mushroom enthusiast. We invited her and her friend to stay for mapping (workshop), but they said they wanted to check out everything else going on at 01 [SJ].

Indeed, a challenge we observed across all our case studies is that the average festival visitor does not seem to be prepared to spend the majority of their festival visit time in a single workshop or engaged with a single artwork. The growBot Garden team thus frequently experienced what we might call "drive-by" participation—where the audience member walks by, slows down their pace to briefly look at the display, perhaps makes eye contact with a presenter, picks up a brochure, and then continues walking. On the off chance that an audience member would stop by, the brief interaction would be a source of frustration for the growBot Garden team, as it was a short and, in the growBot Garden team members' eyes, perhaps not a very substantial or lasting interaction. As one of the growBot garden team members wrote in their notes at the end of one day:

Get your... PAR-tic-A-pat-ory dus-sign here!
That's right! Step on up! 100 hundred percent authentic, 100 hundred percent original,..., student projects galore, robotics and sensing, sandwiches of concept, computers made of cheese and bombs made of blimps!... That's not actually what I said all day, but it might as well have been – I was selling in stripes and straw hat. I'm far more comfortable being involved in workshops than simply pitching the idea of why workshops are valuable – over and over and over and over.

This is echoed by another team member, who likens the experience to that of someone working in retail:

I pitched our idea again and again, hoping to get 01SJ guests interested in the workshops. And while people seemed interested, who knows if they will come back. The next few hours

harkened old days of working retail on a slow day—you greet, you offer specials, people think it's nice but aren't ready to buy, so you just stand there giving the same speech over and over and over again, waiting for someone to take the bait or at least give you some hint that they would come back.

This experience echoes those of both Jeremijenko and Eye-beam, where the artist has a specific notion of the ideal audience member, what it means to be an audience member, and to participate in a show like this, but the actual audience behaves differently. In the case of the growBot Garden project, this was experienced as reducing the desired participation into a 'spiel.' That is, as they repeatedly gave a short, superficial description of the projects on display, the growBot Garden designers and artists were essentially practicing and honing a routinized performance. This performance was presented to each festival guest that stopped by, frustratingly rarely resulting in more in-depth follow-up questions or interactions.

For growBot Garden, several small victories gave glimpses of the envisioned participation. One example was the diversity of participants that attended the growBot Garden workshops in The Garage. On more than one occasion, the participants were children and young adults, which is not the demographic the team members had in mind when designing their workshops. While catering to a different demographic did present challenges to adapt material on the spot to fit a younger audience, the growBot Garden team found these interactions to be among the most rewarding at the festival. The children were curious and ready to start ideating and creating from the get-go and were not inhibited by the speculative nature of the growBot Garden materials and message, an aspect that adult participants generally struggled with. As one of the growBot Garden team members muses:

Although we didn't think extensively about the role of children at the workshop when designing them, it has become apparent that we should have considered them somewhat more. The ideas provided by the children in these brainstorming exercises seem to be wonderfully unrestrained and creative; Dynamite, arrows, camouflaged tigers. While many are ultimately unusable, they are an undeniably creative resource for ideas, many of which could serve as good starting points for the conversation.

Another experienced victory was the effectiveness of their space layout, in which visitors were exposed to both the front- and the backstage areas (Fig. 6) (unlike, for example, xAirport). Just as their work endeavored to create an openness to discovery and invention, the design of their space also seemed to communicate an openness to the project itself: a willingness to experiment and a



Fig. 6. The growBot Garden work/kitchen table.

¹ Team members' fieldnotes contain personal, emotional reactions. They are cited anonymously to protect the authors' freedom of expression.

sense of work in progress rather than polished artefacts. The value of the casual chat and the potential for it to grow into a more intense engagement turned out to be some of the most rewarding experiences recounted in their fieldnotes. For example, another growBot Garden team member relates (highlights are ours):

Although the foraging workshop did not produce any new designs, we did gain a lot of insight into foraging as a practice from our conversations with [participant]. The workshop was casual and fun, and we got to take a nice relaxing walk along a somewhat wooded city stream. [The participant's] enthusiasm for the project made the walk all the more fun. *I think the important thing to take from this is the value of casual conversation created from just doing something as simple as taking a walk with someone interested in the topic.* One thing I have learned from this project is that you only can keep people's attentions for so long. People have other obligations, plans, or just lose interest after a while in a topic. During the previous run of this workshop, the participants were eager to talk for a while about the design of such an application. *Today's workshop, however, we gained our information through casual conversation.* I think we should keep this in mind, and perhaps view the foraging walks as a way of obtaining information about future applications via intentional conversation.

6. Understanding participation in social practice art at O1SJ

Overall, a general pattern emerged at O1SJ. The artists generally started with an explicitly stated aim to support participation through their work, and creatively and carefully constructed situations that supported various understandings of what “participation” means. They ran into many logistical challenges in executing these situations on the ground at The Garage, which often resulted in less participation or different forms of participation than the artists had originally envisioned. Nevertheless, they generally felt that there were substantial successes associated with these projects. So how can we make sense of the challenges and victories we saw and felt on the ground at O1SJ? What more general lessons can we learn about participation?

In this section, we will describe the understanding of participation that emerged from the contention between our two groups. This section was co-written by both groups and represents our joint understanding. We describe how participation was enacted in the projects we saw and the challenges and opportunities involved. We will build on these insights in the final section to demonstrate the potential of this understanding to contribute to HCI research.

6.1. Enacted participation may look different from what is expected

We would argue that across the festival, participation frequently did not look like what we had expected: significant, meaningful, mutual interactions between artists and audiences. Neither did participation as we observed it resemble what the artists themselves had articulated in their artists' statements. Nevertheless, we observed and documented many instances of participation on the ground. How can we characterize these differences?

Compared to expectations that might arise from an HCI perspective to create effective, usable products, it is crucial to highlight that the orientation of artists toward participation is different. In HCI, the focus of research is generally on the creation of effective, usable solutions;² in this frame, user participation is a means toward increasing the quality and acceptability of a particular solution (Asaro, 2000). With

respect to sustainability, then, as described earlier, our expectations as researchers may be that participation will lead to a better technical solution to the problem of sustainability. The aim of the social practice arts projects we saw at O1SJ would be better described as *creating* inspirational experiences, rather than developing solutions to particular problems of sustainability. None of the projects we saw at the festival were fundamentally about creating or using new technology. They were, instead, about crafting and providing experiences that enable audiences to feel some agency with regard to technology in the context of, or for the purpose of, creating a more sustainable society. This difference between creating technology and crafting an experience of agency is crucial. Consider xAirport, for example; as made clear in her interview, Jeremijenko's explicit commitment is to provide an experience that gives participants a sense of agency. She attempts to level the playing field and set the stage for the audience to become experts in their own rights. The goal is not that participants will assist in developing a new flight technology or that the project will provide evidence for the feasibility of wetland landing per se. Rather, it is about that moment in which a participant considers that things might be otherwise. The growBot Garden projects and the personal powerPlant function in a similar manner—to evoke in participants a sense that they might be able to contribute to making things in the world differently.

Two other successes in participation were described by the artists in our case studies which may vary from HCI expectations of participatory design. The first is media coverage, which was seen by Jeremijenko as fostering a broader participation in her artwork for others who were not able to actually personally attend the festival. The second was further development of their projects, as the personal powerPlant collective and growBot Garden both identified. Here lessons learned in interacting with audiences at the festival enhanced their strategies of participation and their specific designs.

Those of us who identified primarily as HCI researchers had initially expected what we might term capital-p participation—deep engagement with artists' ideas and substantial interaction between artists and audience. Much more common was what we might term small-p participation, in the form of brief encounters and casual conversations. For example, although there were fewer participants than desired who participated fully in the workshops, the growBot Garden project did attract hundreds of passers-by for brief conversations, through which general conditions of the issue at hand were conveyed (e.g., urban agriculture, agricultural technology design, etc.). Even when the more substantive factors and effects of the issue were not engaged in these encounters, we should recognize and appreciate these encounters for being participatory. The impact of these encounters for any of the artists groups are unknown, since we had not anticipated this and therefore had not put in place systems to track their effects—in our search for capital-p participation we initially overlooked small-p participation. The frequency of these types of encounters does suggest the draw of the casual encounter as an opportunity to engage serendipitously, in an open-ended fashion, free from expectations and pressure. This may provide another way to consider structuring participatory engagements in contrast or in addition to deployments that require sustained engagement.

6.2. Challenges to participation are systemic

The second set of insights into the nature of participation in social practice art draws from the challenges faced by artists on the ground at O1SJ. Social art practice is conceptualized as based upon an exploratory exchange of ideas between the artists and the public (Kester, 2004; Bourriaud et al., 2002; DiSalvo et al., 2009; Bishop, 2012). Yet what we saw on the ground was consistent difficulty in establishing the conditions and expectations for such

² For example, the widely used HCI textbook Interaction Design defines interaction design as having a main aim of “developing products that are easy, effective, and pleasurable to use” (Rogers et al., 2011, p. 2).

exchange within the context of an arts festival where the a priori roles of artists and visitors differ sharply from each other and from what might be needed for the envisioned participation. This is not to suggest there was the assumption of the arts festival as a mythical public sphere in which all voices and actions would commit to as shared endeavor. In fact, within social practice art the construction and character of the encounter is an ongoing topic of debate (Kester, 2004; Bishop, 2012). The challenge observed and experienced at O1SJ draws out some of the factors affecting this difficulty in establishing conditions and expectations.

For example, the growBot Garden group intended to structure the dialogic encounter through collaborative prototyping workshops, where artists and attendees would co-construct possible futures in material and experiential form. But during the open hours of the festival, this dialogic encounter proved extremely difficult to sustain. In part it may have required more knowledge, or at least interest, in agriculture and farming than most attendees had. For the members of the project, the topics were deeply interesting; they had developed rich ideas around the theme of agricultural technologies. In presenting these ideas to attendees, many responded with real curiosity. But curiosity is not the same as engagement or participation. Curiosity, as we witnessed it, was an expression of interest, an expression of a desire to know more, but not an action toward those ends. It was perceived that attendees found the topic momentarily notable—enough to attract attention, but not enough to sustain attachment. And attachment is important because dialogic exchange unfolds when there are attachments to issues—experiential, affective, or cognitive bonds to a situation or phenomenon (DiSalvo et al., 2011). What was lacking from the growBot Garden project were effective scaffolds to build those attachments necessary to enroll participants into a dialogic encounter.

One way to set up scaffolding is through direct recruiting and commitment. The personal powerPlant was an extended workshop, one that required commitment of a full afternoon. Moreover, it required registration and was conducted in a dedicated space in The Garage, tucked away out of view. The strategy of registration ahead of time should have ensured committed participation—and, indeed, it did, for those who registered. The dedicated space out of view might have also served an important purpose of segregating workshop participants from the hustle and bustle of the rest of the activities of The Garage, communicating a commitment from the workshop facilitators that this was a time to actively unpack issues to be encountered by the group. So one could argue that the staging of the personal powerPlant was relatively successful. The challenge seemed to be one of basic recruiting, which in turn, would seem to be a challenge of communication. How were potential participants to know of this opportunity? How could the Eyebeam group more successfully communicate their goals to potential participants in a location where they had no local network power to speak of, no rapport to draw on, and where the festival context itself implicitly framed participation as short engagements with many projects? Importantly, these challenges arise not simply from ‘mistakes’ of a particular group but from the infrastructural conditions of possibility at the chosen site.

6.3. Institutional and disciplinary frames both support and constrain participation

The site and event of social practice is an important consideration because every site and event is constituted, in part, by a combination of its spatial qualities and the multiple institutional, organizational, community, individual and disciplinary commitments and ideologies of those present, regardless of their amount or kind of participation. The nature of social practice is that the work is, in part, defined by the social construct in which it is

situated. So, within social practice work and theory there is significant discussion of where a work is sited and why and the site itself is often considered to be a significant aspect of the work. For instance, the collective WochenKlausur (<http://www.wochenklausur.at>) often works in community centers. This siting of the work in community spaces is one way it is differentiated from other social practice work, for example the work of Rirkrit Tiravanija, which is often sited in galleries or museums. One siting does not make a work more legitimate than another, but the purposeful siting of the work does express and maintain connections and commitments to different communities and ideologies, through the institutional frames and disciplinary expectations embodied in a given site (see Kester, 2004, Kwon, 2004, or Lacy, 1995 for extended discussion of site).

On the surface, it may appear that the challenges of fostering and sustaining participation artists experienced can be attributed to a convergence of planning and resource issues, like not enough support for prior advertising or additional staff to be present during the festival. One could also focus on spatial qualities of the site which clearly shaped participation, such as how front- and back-end spaces were set up and the placement of the Garage in a cavernous, noisy hall containing projects necessarily encountered in a particular order. Or one could argue that, had The Garage exhibit taken place outside of O1SJ, it would not have been overshadowed by a variety of other things for festival goers to explore, thus allowing visitors the time and space to actively engage with the artists rather than encouraging ‘drive-by’ participation. Or one could see particular approaches to participation that artists took as ‘broken’ in specific ways and expect that, if these were ‘fixed,’ the forms of participation as envisioned by artists would ensue.

All these observations are to some degree true. However, we see these considerations as symptoms of a deeper issue, a series of divergences which had to be negotiated artfully, on the fly, between what artists were able to imagine doing, what the arts festival was able to support, and what audience members were able to conceive of doing or wanting to do; we may add to this list also “what we as researchers hoped to learn”. Each of these groups had different ideas of what ‘participation’ might mean in the context of arts practice. Each group also had different stakeholders to whom they felt accountable to and within each group there were different knowledge bases and skills to draw on in motivating and structuring participation. Given these differences, it is unsurprising that artists ran into serious challenges in establishing the forms of participation they had initially envisioned, and from this perspective their successes are all the more remarkable. These differences in approaches to participation were grounded in differences in the ways in which the art discipline frames the roles, motivations, and practices of each participant (Becker, 1984), particularly within the arts festival context.

For the artists, the arts festival was, among other things, a place to (1) reinforce their identities as professionals within a professional lifeworld where evaluation is based on the judgement of curators, critics, and funders; (2) speak to and develop new positions in ongoing debates within the art world about the nature of social art practice; (3) raise public attention about their work which can support further professionalization, and (4) network with their peers. This framing supports participation because the artists were strongly motivated within current arts practice discourse to explore dialogic methods; indeed, all the artists interviewed for this paper emphasized their interest in engaging participation, though their visions of and goals for participation differed to some degree. They already had gained substantial practical experience with such methods, and the context of publicly performing participation at the festival in front of an audience of knowledgeable peers could provide additional pressure and motivation to succeed in enacting participation, and

feedback about and ideas toward success. This framing also constrains participation because from an institutional perspective, the eventual professional success of artists derives from the extent to which they are able to impress curators, critics, and funders with their work. Since those stakeholders are mostly not present, this success rests more in the ability to narrate projects as participatory before and after the fact and to enroll the press in the work than in actual success on the ground in engaging with festival participants, as was clear, for example, with media success of the xAirport project. Also, we note that the discourse about dialogic art practice necessarily frames participation in such ways that particular strategies and approaches become logical to pursue, while others remain off the radar, which again both supports and constrains participation. For example, all the case studies discussed in this paper originally envisioned participation in a way that required lengthy time commitments from audience members, although growBot Garden came to recognize the value of short-term engagement as well.

For the arts festival organizers, the success of the festival relied, among others, on the ability to (1) attract artists who are considered prominent, (2) attract and entertain public visitors, and (3) gain positive media attention. This framing supports participation because OISJ, as documented previously, is framed around the current arts discourse around participation and therefore attracts artists working with such methods. Also, organizers are structurally motivated to attract a large audience: the potential participants; indeed they were successful in doing so. It constrains participation because the structural focus of organizers is on establishing and showcasing a plethora of projects, which, as we saw with xAirport and growBot Garden, detracted from the audience's desire for in-depth engagement with any one of them.

For the audiences, the festival was generally, among others, a place to (1) have an enjoyable afternoon alone or with companions and (2) see and get excited about what is happening in the arts; artists in this conceptualization are a combination of experts and entertainers. This supports participation because it can be exciting and fun to engage in in-depth interaction with expert artists. It constrains participation because visitors generally want to see many different projects, which limits participation in any one, and because, as growBot Garden team members discovered, they may not have the background or interest to engage with the issues and methods used by the artists, particularly since the artists generally (though not always) tended to resist the “entertainment” framing of the festival. The construction of artists as “experts” and visitors as “audience” also works against meaningful participation as understood by the artists. Finally, visitors are beholden to particular stakeholders – their companions – that may limit an individual's ability to participate in depth (although in some cases this could pull additional participants in).

7. Lessons for HCI

While, as detailed above, there were both clear successes related to participation, and specific, generalizable strategies by which the context and the approaches employed could be improved, what our case study fundamentally demonstrates is how participation at OISJ was both enabled and constrained by its institutional, organizational, and societal context. Participation was clearly limited and channeled by institutional pressures within the festival and the arts discipline, by the expected and experienced roles of artists and audiences, and by the discourses of participation available to the artists; but those same institutions, disciplines, roles, and discourses also made it possible for participation to happen at all. Some of us, at least, had begun our fieldwork with the naive hope that, with their emphasis on social practice art, the artists we studied would provide us with a “magic key” to participation which we could then easily adapt to HCI.

What instead slowly became clear from our case study is that participation can never be total, since participation always take place within specific institutional, organizational, and societal contexts which both make possible and constrain the forms of participation that emerge.

So what does this mean for HCI? What lessons can we learn from social practice art in order to enhance participation? Although the focus of our own thoughts has been on the domain of sustainable HCI, we believe these insights and implications have value to a broader range of HCI research. In what follows, we describe two different kinds of lessons: one primarily draws from recognizing the limitations of social practice art, the second primarily from recognizing the successes artists nevertheless achieved and the strategies by which they attained them. First, we discuss how awareness of the constructed and constrained nature of participation could inform work in HCI generally. Then we describe three specific strategies for achieving participation used by the artists we studied, and show how they could inform three areas concerned with sustainability in HCI – spectacle computing, heirloom computing, and citizen science.

8. Lesson 1: Living in a world of constraint

While it may be easier to see the structural limitations in another discipline, similar structural limitations to the possibility of sustained participation exist within sustainable HCI. While participation for example in the form of enrollment in user studies is an important and rewarded part of HCI research practices, just as with artists the primary measures of and drivers for career success are generally not based in a meaningful long-term dialogue with a particular community (as, of course, some subareas of HCI such as community informatics and action research also grapple with). These measures and drivers shape to some degree how we can imagine and perform participatory design in both academic and industry contexts (Asaro, 2000). In addition, a long-standing issue participatory designers grapple with is how to bring in participants as equals, in a setting where inevitably there are power differences between designers and participants and where even the language of “bringing in” participants already delineates who we imagine to be in control. What our case study suggests is that while there is value in attempting to move beyond these constraints, our success will inevitably be limited—not because participation is hopeless, but because contexts, in enabling participation, also constrain its possibilities.

There is always value in attempting to push beyond these limitations, but another productive strategy may be to recognize the nature of those limitations and work within or around them. From this perspective, we can evaluate the participation that did take place at The Garage not on an absolute, but on a relative scale and with varying dimensions. This acknowledges that each place along that scale has some merit, rather than seeing all the interactions as void of value, and allows one to begin mapping the different opportunities for engagement that are there, even if they are limited. So, for example, the fact that there were only a few participants in the personal powerPlant does not diminish the value of the project to either those participants or the artists. It puts limits on the claims one might make about the breadth of impact, but not the value of the endeavor. The personal powerPlant still has value as a participatory endeavor even though the number of participants was limited. Similarly, though relatively few were able to ride Jeremijenko's zip-line, for those that did, the visceral experience combined with the one-on-one encounter with Jeremijenko was a meaningful experience. This still has value apart from the fact that none stepped through the actual training program Jeremijenko had designed. Thus, an immediate implication for HCI is the need to recognize the particular limitations that our discipline places

on participation, and to identify dimensions on which we can enhance participation within, or at least alongside, the frames that sustainable HCI, and other domains of HCI, make possible.

A second take-away for HCI is to know that some part of the ‘design problem’ is the problem of the institutional frame. Not all researchers, designers, or, for that matter, artists, may want to work within smaller-scale engagements or within institutional frames. In such cases, part of the challenge become the work of adapting to the existing institutions frames, to adapt one’s work to fit. In other cases this might involve designing frames within those institutional frames, making infrastructures to support alternate modes of engagement. With regard to The Garage, we might shift our frame away from the artists to the curators and planners of the exhibition, as they too are designers of events. Reviewing our field notes and project documentation, it becomes apparent that these people, too, are exerting a creative vision and engaging in a design endeavor—that of conceptualizing and actualizing the The Garage programming that was host to all of the projects described in this paper and more. We might imagine a similar approach in which researchers took an active role in constructing an alternate system or venue for the production and dissemination of knowledge relating to HCI. What, precisely, this would be is open to interpretation, but if the idea of drawing inspiration from the arts practices is taken seriously, then one possible course of action is to take on the design problem of crafting new institutional frames and environments, just as the curators and planner of The Garage crafted a new institutional frame and environment for the O1SJ festival.

9. Lesson 2: Learning from artists’ strategies

While artists do not indeed hold a magic key to participation, we did observe several compelling strategies used on the ground by the artists in order to achieve participation, which we here term participation in spectacle, participation in making, and participation in inquiry. Next, we describe these strategies, and use each to rethink how we might approach participation in one area of HCI research related to the environment: spectacle computing, heirloom computing, and citizen science.

9.1. Strategy 1: Participation in spectacle

The first strategy, participation in spectacle, emerged from our analysis of the xAirport project. Spectacle – lavish, striking, inspiring public situations that attract substantial attention – has in 20th century art theory been generally seen as antithetical to participation, as spectacle is thought to turn audiences into passive observers overwhelmed by the artwork (Bishop, 2012). Jeremijenko argues for a different understanding of spectacle as setting up affective participation. In this way of thinking, spectacle, whether experienced in person or through other forms of media or documentation, allows people to learn about a project, to become excited about it, and to become invested in projected alternative futures. This potentially engenders agency in the form of realizing that there are other sociotechnical possibilities, rather than those which seem currently obvious. The goal for such work is to inspire social and cultural change outside of the artwork itself; spectacle as a strategy is intended to function both to give a sense that such change might be possible and to make people motivated to make changes. In Jeremijenko’s case, spectacle appears in part to be intended to capture media attention as a means to communicate to a broad audience to engage them in imagining social change.

Of course, without follow-up or giving people means to effect such a change, it may be difficult to see long-term effect of such an

artwork. However, one could argue that that is not the responsibility of the artist; maybe, as Bishop (2012) argues, we need to see such artworks as one element of a broader activist project toward social change, which needs to involve other actors as well. Spectacle, then, might work best when artists have explicitly conceived how their project can build on and connect to other projects toward social change.

What, then, can we learn about participation in spectacle as a strategy for HCI?

9.2. Implications: Spectacle computing

Within HCI, spectacle has also been explored as a strategy to encourage participation in technological artwork. One prominent approach (Benford et al., 2011; Bedwell and Caruana, 2012; Hespanhol and Tomitsch, 2012) places ‘spectacle’ as a way to draw audience members in to interact with a technology. This framing explicitly emphasizes participation, but frames it literally as ‘interaction with a device,’ a much more limited notion of participation than that imagined by the artists we observed. Much closer to the social practice art sense is the HCI research of Stacey Kuznetsov, who coins the term ‘spectacle computing’ to refer to a HCI design tactic of projecting information into public spheres in ways that playfully encourage engagement with political issues (Kuznetsov et al., 2011b). Kuznetsov has used this tactic specifically to explore environmental issues (Kuznetsov et al., 2011a, 2011b). For example, in one research project Kuznetsov created and deployed fleets of giant, glowing, colorful balloons in public settings to communicate sensed air quality and create a spectacular event meant to draw in audiences to participate in this exploration of environmental issues. Grounded in art theory, this sense of ‘spectacle’ resonates with Jeremijenko’s use, by focusing on constructing affective links to political issues: “Stakeholders who otherwise may not be aware of or care about an issue are drawn into the spectacle” (Kuznetsov et al., 2011b).

In addition to her explicit embrace of the spectacle, Kuznetsov’s work is compelling because she is also explicitly positioned as an HCI researcher. That is, her work draws from the arts, but it is actively positioned as being HCI research and so provides a salient example of the similarities and differences of shaping participation across HCI and the arts. Previously, we argued that the framing of participation within the arts has particular limits owing to the disciplinary organization of that field. We see the same kind of shaping of participation and its possibilities in the way Kuznetsov frames her work in order to make sense within HCI. For example, in the arts, the focus of spectacle is on inspiring the idea of change, while actual change may or may not happen; artists do not have disciplinary structures that push them to account for whether change actually happened. In HCI, there are different disciplinary demands that both support and funnel what is possible. HCI both requires and enables attention to the effects of built systems, but in doing so it almost necessarily frames those effects in narrow ways. So while Kuznetsov is clearly working based on similar conceptions of artwork and participation as Jeremijenko, the enactment of participation in her practices is significantly different. Specifically, Kuznetsov reports on participation and its effects as part of her work documentation and presentation as a component of her HCI research; so, for example, she reports on focus groups of anonymized participants to document their reaction to her work. These methodological choices speak to HCI’s history of drawing on behavioral laboratory studies, in which participants are framed as ideally relatively interchangeable examples of a larger statistical population and in which effects are usually measured during the course of a time-limited intervention. This scientized view of participation would likely be not only alien but also off-putting to many artists in social practice traditions, but

helps to increase the understandability of Kuznetsov's otherwise disciplinarily challenging work as HCI.

To be clear, we are not arguing that the discourses of HCI narrowly require participants to be framed as anonymous subjects and effects to be measured over the course of a short-term intervention. Rather, any contribution to HCI will require authors to make sense of their work within discourses that take these conceptions as fairly natural, in order to gain traction. Works that seek to substantially diverge from the dominant rhetorical structures of HCI will generally need to strongly defend those choices (Gaver et al., 2001) and face the possibility of recuperation to the dominant discourse (Gaver et al., 2004; Boehner et al., 2007).

Indeed, we see such a phenomenon at work in Kuznetsov's uptake. While Kuznetsov sees spectacle computing as a way to engage people in public participation and activism, spectacle computing is described by Bedwell and Caruana (2012), who draw heavily on and promote her work, as technology "attracting and engaging an audience. In many cases, such 'spectacular' technologies are designed with the intention of communicating a message, or changing behavior." This description of spectacle computing appears to miss entirely the activist, participatory intent of Kuznetsov's work and turn it into a form of one-way communication from the designer to the audience. In addition, framing spectacle as being for behavior change shifts the focus from arts-inspired public engagement and social activism to individual behavior, draining the work of its political aesthetic (cf. Leahu et al., 2008).

This example recuperates spectacle to dominant discourses of HCI, and simultaneously drains it of its participatory aspect. What opportunities exist within HCI to instead build on participation in spectacle in the examples we have seen here?

First, we note that spectacle is participatory for Jeremijenko in that it generates affective investment for participants in social issues that otherwise may seem distant by presenting the possibility of exciting, alternative futures. In her work, Kuznetsov demonstrates how to generate public affective engagement using data through spectacle. Additional work related to sustainability in HCI could build on the arts by encouraging civic participation in shaping futures by designing technologies not for present futures but for alternative futures in which sustainability is central (cf. Dunne and Raby, 2013; Gaver and Martin, 2000; Lukens and DiSalvo, 2011), such as Laura Watts' speculative exploration of Orkney Islands futures (Watts, 2012). If we think of the demo as a spectacle designed to increase audience's desire for the availability of a particular technology (e.g., Croft, 2010), then we could leverage the power of demos at public events to generate affective investment in the alternative futures these speculative technologies suggest.

Second, Jeremijenko generates participation as spectacle not only through direct interaction with her work, but also through engaging media attention. The spectacular and public nature of Kuznetsov's interventions suggest similar potential. While much sustainable HCI currently at least ostensibly focuses on reaching people primarily as users of technologies, an alternative design challenge would be to design technologies such that their use or even just their display attracts media attention and in so doing engages the public to consider environmental issues and the role of technology in exacerbating or addressing them.

Finally, we note that a shortcoming of spectacle as leveraged in both the arts and HCI is the short-term nature of the intervention. While mainstream uses of spectacle in HCI mentioned at the start of this section focus on very short-scale participation (i.e., engagement with an interface), and Kuznetsov and Jeremijenko focus on short-scale participation during and immediately after a spectacle, a challenge for both artists and those in HCI concerned with the environment is how to tie the possibility of spectacle with participation in a long-term way with lasting effects. Following

Bishop (2012), most likely a path to success here would involve partnering with community organizations, political groups, or other institutions who know how to achieve long-term engagement and can leverage the HCI-generated spectacle within their own work.

9.3. Strategy 2: Participation in making

The second strategy of participation, participation in making, emerged from our observation and analysis of the personal powerPlant project. In this project, workshop participants engaged in directed activities of material construction, intended both to provide a pedagogical moment and to instill a sense of agency through acquired skills in making.

This strategy of participation has strong affinities to so-called maker culture (Anderson, 2012; Thomas and Brown, 2011), which emphasizes open and collaborative activities of construction and sharing knowledge about how to produce all manner of artifacts and systems. While some aspects of maker culture seem relatively ad-hoc (Jencks and Silver, 2013), other aspects draw upon practices and tropes of craft or the artisanal (Frauenfelder, 2010). The difference between these aspects are important because one emphasizes the amateur, in the literal sense of being un-skilled, whereas the other emphasizes the skilled abilities of the expert, intentionally operating at a smaller-than-industrial scale. This is not to say there is more or less participation as amateurs or experts, but to point out the expectations regarding skill and opportunities for learning should be explicitly accounted for in when designing or assessing participatory encounters. As a strategy, participation in making offers a mode of engagement that is grounded in materials and direct interaction and has the potential to empower participants. At the same time it is important to acknowledge that making often requires expertise, or at least the concerted effort toward the development of skill—making is not easy, certainly not easy for all.

In looking to participation in making to HCI, the fields of participatory design and co-design provide approaches and methods for engaging participants in the processes of prototyping interactive systems (Simonsen and Robertson, 2012). In addition, the design of open platforms such as the Arduino (Mellis et al., 2007) and the LilyPad (Buechley et al., 2008) provide another set of approaches and methods. How, then, might such approaches and methods be focused toward the issues and opportunities of sustainable HCI? And what can we learn from the example of the personal powerPlant project to bolster these efforts?

9.4. Implications: Participatory heirloom making

Much of HCI is directly involved in and concerned with activities of making. With regard to melding together sustainable HCI and participation in making we see opportunity in the area of heirloom objects, and by extension, customization and repair. The basic idea that undergirds the work in heirloom objects is that we tend save those things that have an "heirloom quality" to them (Blevins, 2007; Odom et al., 2012, 2009). This heirloom quality is often correlated with materials and forms of construction that are perceived as being both exceptionally durable and aesthetically pleasing (where the aesthetically pleasing-ness is often culturally specific, e.g., Japan and Sweden may have quite different aesthetics for what is heirloom quality). Saving things may be a way to support a more sustainable approach to possessions and consumption, with the implicit argument that when we save, we don't consume as much, and what we do consume is less likely to end up in landfills. One notable aspect of this discussion of heirloom qualities is that it spans professional design practice and academic design research (Peters, 2009). This breadth of thought and effort

regarding heirloom quality as a design criterion for sustainability provides a range of empirical examples and interpretive frames which will be used throughout this section. Taking heirloom quality as a starting point and returning to the issue of participation, we can ask: What would it be like to re-frame the making of heirloom systems from an activity primarily done by experts (designers, artists, artisans and other crafts-people) to an endeavor of participatory making open to non-experts as well?

David Mellis is a researcher exploring the notion of artisanal electronics—the idea that one might approach the construction of contemporary everyday technical devices as a craft practice (Mellis, 2013; Mellis and Buechley, 2012). For example, Mellis has developed a kit that allows people without substantial computer or engineering skills to construct a working cellphone. According to Mellis, it takes a novice approximately 6 h to complete the construction of the kit, which includes all of the necessary electrical components as well as a wood housing for the phone (Mellis, 2014). Mellis is earnest in this project; he is attempting to explore what it might be like and what resources and skills it would take to support the crafting of personal electronics. As such, many of his projects, like the DIY Cellphone, provide examples of what a more open approach to making might be in the context of digital technologies.

Mellis' artisanal electronics project shares similarities with the personal powerPlant project from the 01SJ festival. Both are concerned with making and with the use of making as a reflective activity, through which one actively considers the context and implications of making in the process of making. Indeed, in both projects the character of the process of making takes precedence over the operational quality of the made thing. This is paradoxical with regard to the term “artisanal”, which tends to suggest an object of a certain finessed quality. Mellis' phone is not necessarily any finer in its form factor, and the interface of the phone is in fact standard, dependent upon the hardware/software package used as the basis for the phone. But still, it offers the potential of making a phone that would possess some heirloom qualities, in that it could be hand crafted with materials of personal value. More generally, the DIY Cellphone project, like the personal powerPlant, engages audiences in material construction as a model for how we might be more involved in the production of our socio-technical environment.

There is, however, an inherent challenge in merging participatory making with heirloom quality things—heirloom design tends to be an expert affair because it requires a mastery of materials. The materials that characterize heirloom objects are materials that are difficult to work with, such as leather, wood, clay. So while heirloom and the artisanal offer possibilities for participation in making in HCI, it's worth probing further still to broaden participation. Two practices that extend the notion of making are customization and repair.

Customization is another direction for participation through making. Generally speaking, customization involves changing an existing product. These changes could be either for functional purposes or for personal desires. The custom car culture provides an example of a robust community of practice that engages in non-trivial changes to fairly complex products, and does so in a way that, for that culture, adds value to the product (Warren and Gibson, 2011). Perhaps more familiar to the readers of this paper are the creation of custom PC cabinets, particularly among gamers, or the customization of phones as a mode of personal expression (Hardwidge, 2006). Customization practices are of interest to heirloom systems because they may have a similar effect of making it desirable to keep an object longer (resisting obsolescence). This is by no means a sure thing. One has to caution that customization may also simply amplify wasteful consumption, if it does not extend the usage of a device—for example, purchasing

decorative cases for a smartphone and then disposing of both the phone and the case in a standard cycle of consumption. So, for customization work as a form of participation in making, the product itself must be lasting, and one mitigating factor that often limits the life of technological devices is the accessibility of repair.

Repair is an area of growing interest in HCI research (Rosner et al., 2013). Much of this interest is reflective of an overlap between science and technology studies and HCI (Jackson, 2014; Jackson and Kang, 2014). For many in hyper-capitalized countries, it may seem odd to think of repair as a kind of making endeavor. But in many countries not defined by excess, repair is a way to add longevity to all manner of items, including technical devices such as personal computers and mobile phones. The challenge with repair is that, as with artisanal electronics (or any manner of construction), repair requires expertise.

Reflecting on the challenges of making, it seems one thing that is needed to support participation in making is scaffolding of learning—intentional ways of fostering the knowledge needed to participate in the construction of contemporary computation devices, whether through artisanal making, customization, or repair. It is worth recalling that in our interviews with members of Eyebeam, they cast the personal powerPlant as a pedagogical project. Perhaps a similar framing is needed for participation in making in HCI. Perhaps it is not enough to create an open platform; what is also needed is a structured approach to facilitating learning through the construction kit. Certainly within HCI there are traditions of working together with educators and learning scientists to understand and bolster learning in informal environments (e.g., Jensen et al., 2012). These examples can serve as starting points for developing practices of participation in making in HCI generally. Working together with those in education and the learning sciences, designers and researchers might customize the pedagogical encounter to specific issues, for example, those of sustainability. In taking this cue from the personal powerPlant we should be mindful of another lesson learned from our ethnographic investigation—such pedagogical encounters are time- and attention-intensive, and this too needs to be taken into account. This notion of learning in participation in making transitions, in which learning and informed action from that learning, are the basis of the next strategy.

9.5. Strategy 3: Participation in inquiry

The third strategy of participation we identified from our ethnographic work is participation in inquiry, which we observed at the 01SJ festival in the growBot Garden project. This project attempted to enroll festival goers in the endeavor of conceptualizing new technological systems for small-scale urban agriculture, through guided exploration of the issues and factors of that design space. For instance, in the Sheep's Clothing workshops, participants learned about the practices and conditions of urban mushroom hunting through guided events. They then worked to conceptualize new sensing technologies, as a kind of in-situ exploration of how such technologies might fit in those practices and conditions. The purpose of this workshop was to provide both the participants and the artists-researchers with mutually informed insight into the issues of designing technologies for small-scale agriculture.

Key to participation in inquiry that attempt to use the methods and contexts of art and design to engage participants in activities of discovery and invention. Like participation in making, it includes activities of construction but it also includes other activities, for example, guided tours or simply the use of new tools in new contexts. What distinguishes participating in inquiry is the emphasis on experiential learning together with the application of that learning toward informed action. Participation in inquiry connects to the pedagogical aspects of social practice and dialogic art (Bourriaud

et al., 2002; Kester, 2004) which in turn is itself inspired by a host of educational theories, perhaps most immediately those of the tradition of critical pedagogy (Darder et al., 2003). Within social practice art this has perhaps been most thoroughly articulated by Pablo Helguera in his book *Education for Socially Engaged Art* (2011). Helguera draws upon the work of Dewey as a starting point to establish social practice as pedagogy and inquiry. This can connect back to HCI through the work of McCarthy and Wright (2004) and Clarke et al. (2014). As a strategy, participation in inquiry strives to broaden participation in the practices of science and technology by making the activity of investigation and experimentation open and accessible. But participation in inquiry requires commitment that is a challenge to achieve and can devolve into the rote work of data collection or classroom-like exercises.

Where are there opportunities to engage in similar activities of collaborative inquiry in HCI, particularly in relation to sustainable HCI or more general environmental contexts and themes?

9.6. Implications: Participation in scientific inquiry

Citizen science is a domain with great potential and some existing outstanding work for the strategy of participation in inquiry. Researchers in HCI have long contributed to the development and evaluations of tools for doing the work of science. Citizen science is concerned with involving non-experts in the work of science and some HCI researchers have begun to explore how to create systems for citizen science. Unfortunately, at times, these systems can involve a fairly reductive form of participation, with non-experts simply being enrolled as data collectors with limited effect of attitude change (Brossard et al., 2005). But in its more engaging forms, citizen science can not only educate and empower non-experts through the development of scientific literacy, it can also work to produce meaningful contribution to science itself, to inform public policy, and to contribute to direct environmental action (Irwin, 2001; Louv et al., 2012; Kuznetsov, 2013).

Over the past decade there has been an increasing interest in citizen science in HCI, in part as a corollary to an increased interest in DIY culture more generally (Paulos et al., 2008; Paulos, 2012). The opportunity of citizen science work is to produce events that foster actual participation in the endeavor of science and technology research. For the HCI community, this can be a challenge because it requires taking a fairly critical perspective on the common lack of participation in the practices of science and technology. Rather than working just to mitigate existing environmental problems (and casting the present and the future as a problem) citizen science work in HCI could also strive to create experiences with and through tools that would allow people to encounter and embody the possibility of participating as active agents in a process of change.³

In their fullest form, citizen science projects engage participants in activities of inquiry that are authentically complex. One common issue is the veracity of data—to what extent is the data collected accurate, and thereby useful as the basis for making claims of taking

action. In a paper titled *Quality is a Verb*, Sheppard and Terveen (2011) report on the quality assurance practices of a citizen-involved environmental monitoring project. As they point out, and as the title of the paper expresses, achieving “quality” in scientific data collection is an ongoing endeavor that requires a significant amount of coordination and negotiation work among multiple actors and agendas (Sheppard and Terveen, 2011). Indeed these activities of coordination and negotiation work are central to scientific and technological inquiry. As Aoki et al. (2009) discuss, this is the political condition of citizen science, and one direction for HCI researchers in this domain might be the development of systems to assist in those contested, yet fundamental, aspects of inquiry. This also extends to practices of technological invention. Indeed, it was the context of technological invention that was the subject of the growBot Garden program, as participants worked to investigate the conditions, opportunities, and issues of developing technologies for urban agriculture, for example, coordinating and negotiating between public and private property in pursuit of mushrooms and other foraged goods. How then, might we pursue work that merges practices of tool and systems building with the experimental approach to inquiry, particularly with regard to contested subjects, such as the environment?

The work of the Public Laboratory for Open Technology and Science (PLOTS) operates at the boundaries of science and technology studies and design and offers another perspective on participation in inquiry. Moreover, the work of PLOTS is a prime example of work that includes scientific tool-building and also extends into the full practices of contested science and technology. PLOTS provides hardware and software toolkits, online forums, and offline events that seek to build a practice of what they term “civic science” (Dosemagen et al., 2012; Dosemagen and Wylie, 2012)—science done in public for the direct purpose of instigating action and influencing decision making and policy. It is a practice of science that puts advocacy front and center. But it is still a practice of science, with attention to the veracity of the data. As data is collected, it is aggregated, examined, discussed, and disseminated using open tools and platforms, made accessible and actionable for others. In addition to being a practice of scientific inquiry, it is also a practice akin to HCI, in that it is based in tools and systems development and assessment, and the members of the organization participate in academic forums, moving their work through traditional channels of academic research. Looking at the ways in which PLOTS is attempting to have impact in terms of community organizing, advocacy, and ultimately policy change, all while engaging non-experts in the practices of science and technology, provides a view on a hybrid practice that HCI might strive toward.

10. Conclusion

At this point in time, participation is particularly important for sustainable HCI and other HCI research in issue-oriented domains. As these domains become integrated into mainstream HCI there is a risk that they become rarified research topics, separated from lived experience and the contexts in which they have social and political implications. Public engagement with and through research provides one potential point of check and balance for issue-oriented HCI research. As we endeavor to engage with the public (and this paper highlights some of the ways this is indeed an endeavor) we come face to face with the assumptions, limitations, and possibilities of our ideas. In many ways, this is precisely the tradition of HCI: to seek involvement from others than designers alone in the making of systems that prototype possible futures. So perhaps it is not a fundamentally strange practice, but rather, a practice that needs to be regularly revisited, renewed, and revamped. Participatory social practice arts provide one frame for doing so, illuminating potentials for both enablement and constraint.

³ Kuznetsov's work, discussed earlier, engages with citizen science from within HCI. For those familiar with this work, it is important to tease apart the differences between that and the direction we are discussing in this section. Kuznetsov et al. use various spectacular forms to engage people in the issues of science, in an attempt to prompt affective attachments to issues, through aesthetically compelling representations and performances. This is an important strategy of participation, and moreover, spectacle and the development of affective attachments can play a significant role in inquiry. But participation in inquiry is differentiated in that the focus is on engagement in the practices of science (or technology) that include activities of investigation, experimentation, documentation, and communication. That is, the focus of participation in inquiry is, or should be, enrolling participants in the mode of research itself. Kuznetsov's work (at least the work reported on at the time of publication) does not do so. There is no judgement about the relative value of these tactics, but for analytical purposes the distinction is important.

We began this research hoping that by moving beyond the boundaries of sustainable HCI research, with its heavy emphasis on persuasion and a fairly moralistic orientation to use, toward the social practice arts, we would be able to find strategies and tactics adaptable to HCI for designers and users to co-create alternative environmental futures using technology. In the end, we believe we have done so, but certainly not in the way we expected.

The arts provide a rich set of inspirational practices that can and should open the space of possibilities for what we might hope to achieve in HCI research. But the arts too are a discipline and profession, with all of the structures and limitations that come with such distinctions. In pursuing cross-disciplinary engagement, then, it may not be enough to focus on identifying intellectual connections such as promising strategies, practices, tactics, or insights. We might also want to consider what kinds of hybrid institutions might emerge from collaboration across these fields. As has been cited throughout this paper, there are many examples of work that strives to blur the boundaries between art and HCI. But little of that work attempts to extend that blurring of boundaries to the institutions themselves—if we want to pursue a hybrid practice of HCI informed by the arts, what might new institutional expectations, settings, and supports might be necessary?

In retrospect, our faith that artists had a 'right' way to approach participation missing from sustainable HCI – a faith, we must note, most strongly held by those of us who were less familiar with on-the-ground practices in the area – was naïve. What we uncovered instead was a better sense of the myriad challenges that face practitioners aiming to change the world within given institutions, disciplines, and social structures. Rather than an easy way out, the arts largely provided a mirror that helped us better understand the complexity of achieving even partial participation within our own discipline.

Certainly, our experiences provide a cautionary tale. As many in HCI strive toward more social engagement through our research, we look to other fields with track records in activism for inspiration. As we do so, we need to take care not to be seduced by the alluring difference of another practice. So, in looking for options, we should be reflective and critical in our assessment not just of HCI but of the other fields we engage with. Then, in our studies of and engagements with other fields we can learn both what enables and what thwarts the kinds of futures we are pursuing.

Acknowledgments

We are immensely grateful to the artists, organizers, and participants at O1SJ who gave generously of their time to make this work possible. We thank our research team participants at the festival for their work in executing fieldwork on the ground: Nick Knouf, Laura Fries, Beth Schechter, Thomas Barnwell, David Holstius, and Dan Letson. Thanks to Fred Turner, Steve Jackson, Dan Cosley, the editors of this special issue, and anonymous reviewers for comments that greatly strengthened this work. This work was supported by NSF grant 1049405 and by the Intel Science and Technology Center for Social Computing. All opinions are those of the authors.

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