

**Talking Plants and a Bug Hotel: Participatory Design
of ludic encounters with an urban farming community**

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Abstract

Due to environmental concerns, sustainability is a growing field of research in HCI. But utilitarian approaches for individual behaviour change that are typical within HCI have been criticised as being too simplistic and failing to take into account the complexity of people's lives.

This thesis contributes a design approach grounded in community-based Participatory Design, and drawing on ludic design, to expand the design space of sustainable HCI beyond individual behaviour change. The thesis demonstrates how the commitments, practices and values of community-based Participatory Design and ludic design can be used effectively with a diverse and non-settled urban agricultural community. The research outlines how this approach can support the values, needs and practices of the community, and allow for holistic understandings of sustainability to emerge.

This is achieved through three case studies conducted at Spitalfields City Farm, in inner East London. The first study was a way to get to know the farming community and to ground the subsequent work in the values, practices and needs of the farm. This was followed by two research through design studies to investigate designing ludic encounters with and for the community: i) *the Talking Plants*, a playful encounter with edible plants to support community engagement and learning, and ii) *the Bug Hotel*, a large musical sculpture for interspecies living, reflection and relaxation.

After describing each case study individually in rich detail I turn to a comparison of their respective processes and the artefacts that each produced in the final chapter. These reflections include a manifesto for community-based sustainable HCI, through a Ludic Participatory Design methodology, as well as strategies and challenges to serve as guidance and inspiration for other researchers wishing to do similar kinds of work with similar kinds of communities.

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Chapter 1 – Introduction

Problem space

Due to environmental concerns, sustainability is becoming a growing field of research in human–computer interaction (HCI). This research tends to focus on persuasive applications for individual behaviour change to be more in line with what designers understand to be “green”. The focus on individual behaviour change is based on a discourse of sustainable consumption that sees the solution to the current environmental crisis as being achieved through technologically driven and expert-led solutions to make lifestyle practices more efficient (Hobson 2002). But utilitarian approaches that frame sustainability in terms of increased efficiency through individual consumer choices have been criticised for having limited efficacy as a result of being too simplistic, for alienating their intended users, and for failing to take into account the complex personal, social, cultural and political factors that impact on sustainability (Strengers 2011; Hazas et al. 2012; Brynjarsdóttir et al. 2012; Hobson 2002). If we limit the design space of sustainable HCI to an individual discourse of sustainability that involves individual moral choice over patterns of consumption (Dourish 2010), then we may be failing to take a broad enough approach to tackling the global environmental crisis.

In order to contribute to this discussion, my PhD research aims to broaden the design space of sustainable HCI by investigating new approaches to

- 1) disrupt the dominant narrative of efficiency and productivity; and
- 2) include in the discussion non-“expert”-led voices about what sustainability means and how alternative understandings can influence the design space.

In attempting to meet these research aims I have employed three complementary strategies. Firstly, I have chosen to conduct long-term (three years) research within a single site at Spitalfields City Farm, in inner East London. I chose to work with a small-scale urban agricultural community because such sites allow us to study the critical interrelations between social, economic and environmental factors that impact on sustainability (Hirsch et al. 2010; Odom 2010) and therefore help broaden our understandings of sustainability beyond individual behaviour change. In addition, they answer the call within HCI to move the focus from consumption to production (DiSalvo et al. 2010), from individual to collective action (Ganglbauer et al. 2013), citizenship and community (Baumer & Silberman 2011; Hirsch et al. 2010), and from competition to cooperation (Dourish 2010).

Secondly, I have chosen to base my methodology on Participatory Design (Robertson & Simonsen 2012; Bødker 2000; Kensing & Blomberg 1998a; Muller 2009), a set of theories and practices for involving those who will be affected by a system as full participants in the design process. I have chosen this methodology as a way to include more voices in the debate about what sustainability means and to include those who will be affected in the design process, thereby making the designs more meaningful and relevant in their lives, and overcoming the alienation that is typical of persuasive sustainability (Hobson 2002; Brynjarsdóttir et al. 2012; Strengers 2008). More specifically, community-based Participatory Design (DiSalvo et al. 2012) reflects a more recent trend towards conducting Participatory Design research with community-based organisations and other groups with less formal structures than the workplace contexts of traditional Participatory Design research. Such community contexts present their own challenges and opportunities, as I describe in Chapter 2.

Finally, in order to disrupt the dominant narratives of utility and efficiency, I have drawn on ludic design (Gaver 2002), a strategy for play and pleasure that has been used within HCI to support multiple interpretations and open up

new perspectives on serious issues. By employing reflection and ambiguity as resources, a ludic design approach allows for personal meaning-making and appropriation, and for non-utilitarian discourses of sustainability to enter the design space.

Research questions

With these goals and strategies in mind, I have conducted this PhD research with the following overall research question in mind:

How can the design space of sustainable HCI be expanded through a community-based Participatory Design methodology with a ludic focus, in the context of an urban agricultural community?

This question raises the following additional questions relating to the research at Spitalfields City Farm:

- How can ludic encounters be designed to support the farm and, potentially, others with similar values?
- What understandings of sustainability does this approach elicit, and how do they differ from those based on a discourse of sustainable consumption?
- What are the challenges and opportunities of community-based Participatory Design when working with diverse and non-settled communities such as Spitalfields City Farm?
- What methods are culturally sensitive and appropriate to inclusive engagement of the community?

I have attempted to answer these questions through three case studies conducted over three years with Spitalfields City Farm.

Research methodology: community-based Participatory

Design with a ludic focus

As I discuss in Chapter 3, my methodology is rooted in community-based Participatory Design and is underpinned by the non-utilitarian, open and playful values of ludic design. Participatory Design and ludic design are not often brought together. Focusing on ludic encounters through a Participatory Design methodology with a community-based organisation has allowed me to conduct the research within the messy reality of the farm context. I am drawing on ludic design but not subscribing wholesale to the approach as it has been used traditionally. I am basing my methodology on Participatory Design, but have looked for ways to overcome its traditional utilitarian focus. In order to overcome these limitations I've taken elements from both. In particular, I focus on aspects of community-based Participatory Design that allow for community building, education and cultural production (DiSalvo et al. 2012).

I have conducted the research in the context of small-scale urban food production. By working with people who are practising more sustainable lifestyles I have been able to include more diverse voices about what sustainability means beyond an understanding of sustainable consumption, which drives much of the existing HCI research into individual behaviour change. The aim of the research is not to directly change the behaviour of those with whom I am working to behaviour that is more in line with what I consider to be sustainable. Rather, it is to learn from a community that already does things differently and to support what they do. I'm trying to add value to the community and the sustainability work that it does through my creative endeavours, and I have attempted to demonstrate that there is value in supporting the community in this way.

I have taken a case study approach that includes an initial exploratory study followed by two research through design case studies conducted at Spitalfields City Farm. The first study (described in Chapter 4) was a way to get to know the farming community and to ground the subsequent work in the values, practices and needs of the farm, as identified through this exploratory study. I then present findings from two research through design studies that describe ludic encounters that use digital technology to support the values of the community: i) *the Talking Plants* (described in Chapter 5), a playful encounter with edible plants designed to support community engagement and learning, and ii) *the Bug Hotel* (described in Chapter 6), a large musical sculpture for interspecies living, reflection and relaxation. As I highlight in Chapter 3, both ludic design and Participatory Design research are examples of research through design in that they are both concerned with producing new communicable knowledge through the designed artefacts and their accompanying reports. The data produced by these three studies are analysed through a thematic analysis (Braun & Clarke 2006), as described in Chapter 3, and organised into themes and sub-themes and then presented as a set of findings relating to each study. In the final chapter (Chapter 7) I compare and reflect on the findings from these case studies through a set of strategies and challenges that are intended as guidance and inspiration for other researcher-designers doing this kind of work.

Background to the research

In this section I provide background to how the research was initiated, and how I was first introduced to the farm.

As part of the first year of the four-year PhD in the Media and Arts Technology Doctoral Training Centre at Queen Mary University of London I was required to undertake a six-month internship and write a report. I chose to undertake an internship with a community arts organisation called ActiveArt on an

intergenerational, “eco-literacy” art project based at Spitalfields City Farm. I started working as a technical intern on the project in the summer of 2011, helping ActiveArt to design and build the interactive elements of the Talking Quilt. This was a traditional textiles quilt that was produced by ActiveArt along with staff, volunteers and visitors to the farm in a series of workshops. Oral history interviews were recorded with participants, looking at the connections between food, food growing and community. The project was part of a wider research project with collaborators from the University of Manchester, the Open University and the University of Brighton, and funded by AHRC through the Connected Communities stream. It was to serve as a celebration of the farm, offering a snapshot of the community at this point in time. Incorporating interactive technologies to play back the audio interviews into the quilt was a way to make the handmade traditional object contemporary and to give it an extra dimension beyond the visual, tactile qualities of the quilt. Users could interact with the quilt by wearing an oven glove embedded with RFID (radio frequency identification) tagging technology. They could scan the quilt with the glove to play back the voices of over 80 staff, volunteers and visitors as they talked about the connections between food, food growing and community.

The format of a quilt was chosen for its role as a domestic object, its ordinariness, and its capacity for collective making. New technology in the form of interactive buttons to trigger playback of audio interviews was used in an attempt to bring the quilt to life, to make it contemporary and to augment the experience of interacting with it without changing its qualities as a visual, tactile and handmade object.

While ActiveArt ran workshops with the community to stitch and dye the hexagonal fabric patches that would be sewn into the quilt, and conducted the interviews, I worked off-site to develop the technological system for embedding the audio recordings. I devised and built the interactive system to provide an enjoyable and intuitive engagement with the quilt. For my internship report I investigated how the interactive elements could support the

audio content and the meaning-making of the quilt. The aim was to develop a system that would facilitate a playful and pleasurable experience for audiences physically interacting with the quilt, whilst also allowing them to learn something about food and community and perhaps evoking their own memories and thoughts around the topic. (See Heitlinger & Bryan-Kinns (2013) for further descriptions and reflections on this research.)

In contrast to more traditional PhD programmes where students start the research with a topic and research question in mind, the four-year Media and Arts Technology programme only requires students to identify a research topic once the internship has finished and they embark on their second year of study. It was once I had reached this stage that I decided to continue and build on the work I had undertaken as part of this internship, for the remainder of the PhD. I had been inspired by the Talking Quilt project, and by the farm community, and considered ways to continue and build on my experiences. For example, I was interested in how the augmented everyday object of the quilt had allowed for playful and enjoyable interactions to support engagement with rich audio content. I was interested in how the quilt supported multiple meaning-making for those who experienced it, and how it offered an accessible and intuitive interaction that encouraged discussions amongst people. I was also interested in how the multisensory elements of the quilt, which invited a visual, auditory and tactile engagement, helped to bring the hidden stories to life in a compelling and complementary way. It was these aspects of the technological augmentation of the physical object of the Talking Quilt that I wished to take forward in the PhD research.

However, in hindsight I realised that the making of the quilt had involved a deep participatory process that was based on relationships developed over time between the artists from ActiveArt and members of the farm community. I had not been a part of this process and I therefore lacked an understanding of the farm: its activities, concerns and ways of operating, as well as the varied subcommunities that it serves. I had not been involved in the many rich and

fruitful conversations that arose as people sat and stitched together. In thinking about my research methodology, I realised that I wanted to involve the community in the design process. In addition, I wanted to draw on my skills and experiences as a socially engaged artist, working sensitively with diverse and often marginalised groups such as the visually impaired, disadvantaged youth, street kids in the Ukraine, and Romany Gypsies in rural England. In addition, many of these projects had involved the use of sound and digital technology, and I wanted to build on my knowledge of using these.

I chose to continue working with Spitalfields City Farm because it tapped into my interest into cooperative and creative grassroots communities, and because the farm community shares my concerns about the environment. I had worked previously on sustainability-related arts projects, such as *Privileged Tactics II* (together with my collaborator and partner Franc Purg), which won a UNESCO Digital Art Award and drew on our experiences with rubbish recyclers in Cairo. Choosing the farm as a site for this research, Spitalfields City Farm presented an opportunity to examine how my creative endeavours could support a sustainable community and help make it stronger. I wanted the research to do this work through the intersections of art and design, technology, community, participation and sustainability.

Working with the farm community was new in that I did not have any prior experience of urban agriculture. However, I was experienced in working with very diverse communities through community-based art projects and in this way it was not a new direction for me, but, rather, a recognition of how I could take up some of the practices I was familiar with and connect them to a research project.

By choosing to work with the farm I acknowledge a political commitment to an issue of social and global concern: sustainability. By choosing to work in a participatory way, I acknowledge my methodological commitments towards the community and to improving the lives of those who will be affected by the process and outcomes of this research.

The work presented in this PhD was undertaken after the completion of the work on the Talking Quilt, and is separate from it.

A note on my participants

A number of key participants from the farm have been part of this co-journey. Mhairi, the farm manager, has been instrumental in supporting my involvement in the farm, by offering encouragement and guidance throughout. She provided the space for me to conduct the workshops and meetings, and helped recruit participants, including staff. She also helped to clarify the goals and motivations of the research. Olivia, the growing coordinator, and Mandy, the volunteer coordinator, were key participants in the Talking Plants case study. The project was developed to support the work they were already doing as growing and volunteer coordinators, and their input was an integral part of the project. The collaboration with Esther, the education coordinator, started in the exploratory study (Chapter 4), and continued throughout the research timespan, through discussions, workshops, meetings, design concepts and a consultation event, culminating in the Bug Hotel (described in Chapter 6). Tess, a long-time gardening volunteer, Richard, a growing coordinator, and Lutfun, a gardening coordinator, were other key participants who accompanied me on this journey. They contributed their ideas, stories, and insights as we gardened, ate and attended events and workshops together at the farm.

Contributions

The thesis contributes to the field of HCI by showing how community-based Participatory Design, coupled with a ludic approach, in the context of an urban food-growing community can be used to expand the design space of

sustainable HCI beyond the dominant focus of individual behaviour change. I have done this by building and evaluating with the community two interactive systems (described in Chapters 5 and 6) and demonstrated how they have supported the core values of education, community, well-being and sustainability (as identified in Chapter 4). I have demonstrated how the ways in which these values are interlinked offer a holistic conceptualisation of sustainability that expands the dominant narrative within HCI of sustainable consumption. I have also demonstrated how coupling community-based Participatory Design and ludic design has helped include more voices in the debate about what sustainability means and how these understandings can influence the design space. I have provided evidence from stakeholders that the approach has helped strengthen existing sustainable practices and communities and given value to their existing work and is therefore an effective way of broadening sustainable HCI. I have shown that this methodology is useful in the context of food systems; whether it is useful in contexts besides food systems is left open to other researchers to determine. In the final chapter (7) I consolidate the approach developed throughout the research and present a manifesto for a community-based sustainable HCI through a Ludic Participatory Design approach.

The thesis contributes to the field of Participatory Design by extending and building on the emerging focus of community-based Participatory Design. I have made this key contribution in three ways. Firstly, I have done this by situating my work within a non-settled, diverse community-based organisation, based on an active notion of difference rather than on the static, homogenous notion of community that is common within Participatory Design and HCI. In this way I have contributed to expanding the ways that community is understood within Participatory Design and HCI. Secondly, I have contributed to the field of Participatory Design by describing in rich detail the participatory process and how the participation was configured, including the roles and relationships, how decisions were made and control shared, how the projects

were initiated and who benefited, and the different ways in which participants were engaged. Thirdly, by reflecting on the both the process and artefacts, and by describing strategies for and the challenges of doing this type of work, I have offered other researchers and practitioners resources for doing design work with and for communities that are sensitive and culturally appropriate.

The research through design case studies have contributed to ludic design by taking design that is typically intended for domestic contexts and examining how the principles and values of the approach can be applied in a bespoke way to a community and public setting. This extends the very recent work in ludic design around energy communities (Gaver et al. 2015).

The research expands the nascent focus of small-scale urban food production within HCI by looking at how non-utilitarian design can help add value to sustainable communities.

The research also contributes to the public domain through the design artefacts that were produced as part of the research methods. The Talking Plants project described in Chapter 5 was shown to the public at three well-attended public events at the farm; the Bug Hotel described in Chapter 6 is permanently installed at the farm.

Finally, this research will be taken up at postdoctoral level, supported by the Engineering and Physical Sciences Research Council (EPSRC). As a direct result of this research, Spitalfields City Farm is a partner on an 18-month project looking at the Internet of Things and sustainable urban food production.

Document structure

Chapter 1: Introduction describes the motivation, research aims and questions, background, contributions and structure of this thesis.

Chapter 2: Literature review presents four main sections of literature that are relevant to this thesis. I start with an overview of sustainable HCI, including the dominant focus of sustainable consumption and the criticisms levelled against this framing. I discuss some suggestions from the literature about how to expand the design space of sustainable HCI, such as changing the focus from individuals to groups, involving users in the design process, and designing for reflection rather than for prescriptive solutions. In the second section I present an overview of food and sustainable HCI, with a particular focus on urban and small-scale food production. The third section presents ludic design, an approach to design that aims to disrupt dominant narratives of utility and efficiency. I provide examples from the literature, including ludic design for serious issues and sustainability. The final section of the literature review describes Participatory Design, which has been used to include marginal voices within design, and to include those who will be affected in the design process. In particular I present a more recent turn within the field away from traditional workplace contexts, towards community environments and their concerns. I conclude the chapter with a discussion of “community”, drawing on fields outside HCI, and of implications from this discussion for HCI researchers working with communities.

Chapter 3: Methodology presents an overview of my research methodology, which is underpinned by community-based Participatory Design with a focus on ludic engagements. I explain my rationale for choosing this approach and not others, and how drawing on both Participatory Design and ludic design allows me to conduct research in the context of the farm, with the aim of expanding the design space of sustainable HCI. I describe a research through design case study approach, where the designed artefacts and accompanying reports communicate the new knowledge contribution of the research. I provide an overview of how I conducted the studies, including how and why I used thematic analysis to analyse the data generated from the case studies.

Chapter 4: Exploratory study presents a study at the farm that drew on methods and principles of community-based Participatory Design and included participant observation, interviews and workshops. The aims of the study were to better understand the values, needs and practices of the community, to build relationships with participants, and to understand current and potential future uses for technology to support the farm. I present the study findings according to themes that I constructed in a thematic analysis of the data. The themes include: community, sustainability, education, well-being, technology use, and methodological tensions. The chapter also presents implications and opportunities for designing with digital technology to support the values, practices and needs of the farm, which are used to inform the subsequent research through design studies.

Chapter 5: Talking Plants presents the first research through design case study. The chapter describes a ludic encounter to support the work the farm does by encouraging learning about and participation in growing and preparing edible plants. Informed by the exploratory study (Chapter 4), it aims to support the values, needs and practices of the farm, whilst also offering ways to expand the design space of sustainable HCI through ludic encounters that provide for reflection and multiple meaning-making. The chapter provides a detailed description of the process of working with the community. It presents findings from a thematic analysis of the data produced, which is organised into themes and sub-themes. These include how the project provided new perspectives on sustainability, how users experienced the interactive system, and how it gave value to the farm by providing opportunities for inclusive community engagement and learning. The analysis also reports on findings from the methodology, including how participants were engaged, how control was shared, and how I presented myself as a resource to the community.

Chapter 6: Bug Hotel presents the second research through design case study. The chapter describes an interactive sound sculpture that is intended

as an experiment in interspecies living and is now permanently installed at the farm. The aim of the study was to extend the community-based Participatory Design methodology developed in Chapters 4 and 5 by allowing for a greater participatory involvement of the community in the decision-making process. The study also aimed to investigate how playful and reflective experiences with hidden and overlooked elements of the farm could contribute to alternative understandings of sustainability. The chapter describes in rich detail the process of working with the farm community, as well as with an artist who was employed to help design and build the physical structure. I describe how decisions were made, how the community was involved, and how control was shared. I present findings from a thematic analysis of the data produced during the study on how the final outcome helped to add value to the farm by supporting community cohesion and community building, and build on the farm's work on sustainability. I also discuss how the project was experienced and appropriated by the community. Finally, I present findings on the ways in which I engaged the community in the design process, including the benefits and risks of privileging a flexible open approach to design over one that is more clearly planned.

Chapter 7: The Conclusions chapter presents my reflections on the research. I start with a manifesto for community-based sustainable HCI, through a Ludic Participatory Design methodology. This is followed by a set of strategies and challenges for doing similar kinds of work with similar kinds of communities. I conclude the chapter with final words and a discussion about how this research will be taken up and extended through postdoctoral work funded by EPSRC and in collaboration with Spitalfields City Farm.

Note to the reader: The understandings of Participatory Design and sustainability that are developed within each chapter are contemporary within the work. In the Conclusions chapter (Chapter 7) I reflect on and sometimes substantially change those understandings.

Chapter 2 – Literature review: sustainability, non-utilitarian perspectives, and involving users in the design process

Introduction

In the previous chapter I introduced the problem space of the research and how I proposed to contribute new knowledge by asking **how the design space of sustainable HCI can be expanded through a community-based Participatory Design methodology with a ludic focus, in the context of an urban agricultural community**. In this chapter I present a critical review of the literature from the relevant fields, which is a first step in answering my research question.

I begin the chapter with an overview of the recent growth of the field of sustainable HCI. The literature highlights that these are typically efficiency based, expert-led technological solutions to the problem of individual behaviour change to be more in line with what researchers understand to be sustainable (DiSalvo et al. 2010; Knowles et al. 2013). A critical review of these approaches indicates that such a framing of sustainability is based on modernist discourses around economic rationalisation and sustainable consumption (Hobson 2002; Brynjarsdóttir et al. 2012). I introduce the main criticisms levelled against this dominant approach – namely, that such a framing of sustainability limits the design space and, furthermore, has limited efficacy (Snow 2013; Abrahamse et al. 2005) due to its failure to address complex social, cultural and political issues (Dourish 2010; DiSalvo et al. 2009), and that it marginalises different voices from the debate (Hobson

2002). I present suggestions emerging from the literature about how to expand the design space of sustainable HCI.

This is followed by a narrowing in on the domain of food and how it impacts on sustainability. I present an overview of the ways in which emerging HCI research is beginning to take an interest in food. In particular, the literature suggests that studying urban and small-scale agriculture – which is the context in which I have chosen to site my PhD research – provides opportunities to critically investigate the complex relations between the environmental, social, cultural and economic concerns that food touches on, and therefore points to ways to expand the design space within sustainable HCI (Odom 2010; Hirsch et al. 2010; Choi et al. 2014).

However, solutions to the problem of sustainability, even within the domain of urban agriculture, still tend to focus on utilitarian solutions to increase efficiency and productivity. In order to expand the design space further, I discuss non-utilitarian design philosophies stemming from the third wave of HCI that draw on methods and values from the arts and humanities. In particular, I present ludic design, which has typically been used within HCI to disrupt dominant narratives of utility and efficiency, but which also has a history of dealing with serious issues such as environmental concerns (Gaver 2002; Gaver et al. 2013; Gaver et al. 2015).

In order to address my research aim of including more non-“expert”-led voices about what sustainability means and how such understandings can influence the design space of HCI, I discuss approaches that involve users in the design process. In particular, I focus on community-based Participatory Design (DiSalvo et al. 2012) because it values both the process and designed outcome, and presents opportunities for creativity and cultural production, as well as highlighting the challenges of working with the informal structures and social relations of community-based organisations such as grassroots urban agricultural communities.

Sustainability in HCI

Concerns about the environment, and in particular climate change, have sparked a growing body of work in sustainable HCI. This research typically focuses on applications that persuade individuals to behave in ways that are “greener” (DiSalvo et al. 2010; Brynjarsdóttir et al. 2012; Knowles et al. 2013). Examples include devices, mobile phone applications and systems to help reduce energy consumption (Chetty et al. 2008), shower water consumption (Kappel & Grechenig 2009), and household waste (Gartland & Piasek 2009), or to influence green transportation habits (Froehlich et al. 2009). A great many of these studies attempt to directly tackle the reduction of household electricity consumption by providing energy feedback artefacts. (For a survey of eco-feedback literature in the CHI/UbiComp communities, see Froehlich et al. 2010.)

DiSalvo et al. (2010) mapped the landscape of sustainable HCI in 2009; Knowles et al. (2013) surveyed it again in 2013, while Brynjarsdóttir et al. (2012) surveyed the field of persuasive sustainability in HCI. These three overviews came to the same conclusions: that sustainability research in computing is primarily about expert-led technological solutions that frame sustainability in terms of behaviour change of individual consumers. Of the 157 papers that DiSalvo et al. (2010) survey, around 70% targeted users as individual consumers, while 45% comprised persuasive technologies, and 25% dealt with ambient awareness or eco-visualisations, seeking to present information to users in such a way as to encourage more “*proenvironmental behaviour*”. Knowles et al. (2013) include a recent corpus where DiSalvo et al. (2010) leave off, covering the period 2010–2012. Their findings from a survey of 122 “*sustainability*” papers showed that the vast majority of all computing papers (from CHI, UbiComp, DIS and Pervasive conferences) deal with individual behaviour change, indicating that the broader trends since DiSalvo et al.’s overview are continuing. Common approaches include ambient

awareness, persuasive technology, eco-feedback and gaming. They find that *“economically-driven questions are at least as prevalent in computing as environmentally-driven questions. Socially-driven questions, less surprisingly, represent no more than one-fifth of the Top 100 corpus”*.

Where does this focus come from?

The focus within sustainable HCI on behaviour change of individual consumers can be traced back to a discourse of sustainable consumption, which is a key concept in the sustainable development paradigm (Hobson 2002). Sustainable development is predominantly defined as economic and social development that meets human needs now without compromising the ability of future generations to meet their own needs (WCED 1987 – this is what is commonly referred to as the Brundtland Commission definition). Within this discourse, sustainable consumption is about the “rationalisation” of lifestyle practices, which basically means doing more with less. This is achieved through technologically driven and expert-led solutions to make lifestyle practices more efficient and shape *them* *“according to the logic of instrumental rationality, as part of a prevailing ecological modernisation paradigm”* (Hobson 2002). Brynjarsdóttir et al. (2012) explained this modernisation paradigm within sustainable HCI by drawing on sociological theory on modernism:

Modernist approaches to technology tend to be predicated on quantifying aspects of human life, focus on improving the efficiency of everyday processes, intend to have predictable effects, and in order to do so necessarily aim to increase control over the vagaries of those processes.

The technologies of persuasive sustainability *“embody trust that, through scientific and technical intervention, we can solve the problem of sustainability”* (ibid.). In this efficiency-focused rationalisation discourse,

technology is used to present information to individuals, which results in increased awareness and subsequent behaviour change. As Dourish points out (2010), the focus on individual behaviour change within sustainable HCI reflects the market logic of individual rational actors, in which one's ability to affect change is through a limited series of individual choices offered by the market (Dourish 2010).

Dourish argues that the focus on individual behaviour change within sustainable HCI is due to the unexamined underlying sociocultural, political and economic factors that drive research. Specifically, he is referring to the ideological framework of a neoliberal capitalist system, which pervades every aspect of life, including environmental management. The logic of such a system is automatically geared toward individual action. Taken to extremes, it results in "free market" environmentalism, which includes trading pollution rights and carbon offsets, transferable fishing quotas and utility privatisation, which are all part of "*the naturalization of market models as means of aggregating individual action for collective ends*" (Dourish 2010). Translating the "environment" into a set of externalised resources or "natural capital" – "*bundles of 'goods' and 'bads' to be managed in the name of risk mediation – is the first crucial step in the construction of prevailing rationalisation approaches*" (Hobson 2002).

In a survey of computing papers both in sustainable HCI and in green IT (the latter having a more engineering vs a more human-centred focus), Knowles et al. (2013) suggest that computing in general is dominated by a particular discourse around sustainability, one that is reformist and premised in a Triple Bottom Line construction of social, environmental and economic needs, as embodied in the Brundtland definition (Knowles et al. 2013). The authors draw on the book *The Politics of the Earth* (Dryzek 1997), which surveys different environmental discourses. Sustainable development is reformist because it "*does not seek a major overhaul of the dominant worldview, and instead seeks a solution that fits within our familiar mode of instrumental rationality*"

(Knowles et al. 2013). The reformist environmental discourse that sustainable HCI is typically based on assumes that the goal of sustainability is the continuance of the current standard of living for future generations. Likewise, sustainable HCI research “*seeks to guide technological development toward these same ends. In both cases, ‘growth’ is not in itself the problem – rather, when guided responsibly, it is seen as a solution*” (ibid.).

The problem with this approach

Voices both within and from outside HCI critique this dominant narrative of individual behaviour change based on a sustainable consumption discourse. The main arguments against this approach to sustainability can be summarised as follows: framing sustainability in terms of sustainable consumption is too simplistic; social, political and economic relations are taken for granted; and other voices about what sustainability means and how these definitions impact on the design space are marginalised and excluded from the debate. I will now elaborate on these claims in greater depth.

The framing of sustainable consumption is too simplistic

The first critique of persuasive technologies in general and persuasive sustainability in particular is they are too simplistic to tackle big complex problems such as sustainability. This is because they are approached as a “*modernist enterprise*” (Brynjarsdóttir et al., 2012) and are therefore susceptible to particular kinds of breakdown. Persuasive sustainability is modernist in that scientific and technical intervention is trusted to solve the problem (of sustainability). For example by using sensors to track and report on human behaviour we are able to optimise and control that behaviour according to a top-down selection of metrics, and in this way the modernist approach trusts that we have captured the essential aspects of the situation. The reason they break down is that their “*success is often predicated on an assumption that all factors have been taken into account. They tend to be*

blind-sided by factors outside of what was formally modelled" (ibid). The authoritarian control that is based on expert knowledge breaks down when it doesn't achieve compliance. And this control is illusory because it is only based on the limited aspects of the problem that is of interest to the modeller, and not those who are being modelled. There is limited evidence of efficacy of persuasive sustainability technologies, particularly over the longer term (Abrahamse et al. 2005; Snow 2013; Brynjarsdóttir et al., 2012). For example, the scale of reduction of water or electricity consumption tends to be around 10% and is short-lived (Hazas et al. 2012). Brynjarsdóttir et al. (2012) argue that furthermore, the design space has been limited to such an extent that it is repetitive and lacks innovation.

The main breakdown of persuasive sustainability is its too-simplistic understanding of sustainability and its failure to take into account social, cultural or economic concerns. As Hobson (2002) writes, "*The project of sustainable consumption, through its prevailing policy framing, appears to fundamentally misrepresent what matters to individuals in terms of social and environmental concerns*". For example, Shove writes about how resource use is intertwined with cultural assumptions about cleanliness and consumption (Shove 2003), while Strengers (2011) claims that, even given correct interpretation of eco-feedback data, members of a household may not act on it because their existing practices are felt to be non-negotiable. Hobson (2002) argues that the discourse of rationalising lifestyles fails to take into account bigger and more pressing social concerns, and therefore comes across as a form of social control through self-discipline. It also "*actively alienates [users] from the very causes it seeks to promote, thus reinforcing the status quo*" (Hobson 2002). Furthermore, modernist designs

*tend to be blind-sided by factors outside of what was formally modeled
.... Problems come about, for example, when the technology's
necessarily limited judgments are seen and presented to users as
absolute values which reflect the true sustainability of their behavior,*

rather than as partial views of a much larger and more complex problems. (Brynjarsdóttir et al. 2012)

The system relies on authoritarian control over users' lives, and may only solve the problem by achieving compliance. However, because it fails to take into account other aspects of reality that are beyond the interest of the modeller – but may be of interest to those who are being modelled – this control is illusory and the system breaks down (ibid.).

These and many other critics (Dourish 2010; Sengers et al. 2009; DiSalvo et al. 2010; Knowles et al. 2013) argue that, by focusing only on a single discourse or definition of sustainability, we are unnecessarily limiting the design space and reducing opportunities for creating impact. By blindly accepting the dominant underlying sociocultural, economic and political factors that influence design, we may be failing to take a broad enough approach to tackling the global environmental crisis.

Social, political and economic relations and forms of practice and power are taken for granted

As Hobson (2002) argues, paraphrasing Bruno Latour (1993) amongst others, discourses are never neutral. Rather they implicate social, political and economic relations, forms of practice and power, and epistemological positions. In the case of sustainable consumption and persuasive sustainability,

a discourse has been formed that does not threaten consumption as a form of practice but seeks to bind it to forms of knowledge – science, technology and efficiency – that embody the locus of power held by high-income countries in international relations. (Hobson 2002)

Knowles et al. (2013) concur with this point, claiming that in this way the status quo, in which the richest nations consume the greatest proportion of energy, is maintained. *“Rather than exploring alternatives to what has been argued as an inherently unsustainable digital economy, or challenging the*

instrumentalization of the sustainability problem, computing seeks sustainability wins that can be found within the dominant ideology of our technological era” (Knowles et al. 2013).

Brynjarsdóttir et al. (2012) claim that a modernist approach in which experts decide what constitutes sustainable behaviour, and embody this in a technology that will judge users’ behaviour, rarely examines the politics involved, such as who gets to use resources, for what, and why. Questions about what ought to be sustained remain unexamined (Knowles et al. 2013; Brynjarsdóttir et al. 2012).

Another way in which politics and power are implied in the discourse of sustainable consumption is through its framing in terms of individual moral choice over patterns of consumption. Political participation is downgraded to everyday consumption in which the only way one can operate politically is through a limited series of choices offered by the market (Dourish 2010). This in turn raises questions about who can afford to choose sustainable behaviour (e.g., to buy local organic produce or hybrid cars). The cost of the *“naturalization of [the] market”* even in terms of the environment comes at significant cost: by putting the onus on individual consumers it absolves states and corporations of responsibility (Hobson 2002); it also approaches the solving of collective problems through competition rather than cooperation (Dourish 2010).

Marginalises other voices

The final critique of the dominant sustainable consumption paradigm is that it fails to include other discourses, and alienates other voices from the debates about what sustainability means and how these could influence the design space. *“The rationalisation discourse of sustainable consumption [has] little resonance with individuals who embrace other, ‘alternate discourses of consumption”* (Hobson 2002). The top-down framing of persuasive sustainability *“reinstates the authority of the designer and the technical object”*

(Brynjarsdóttir et al. 2012). This fails to take into account the much larger and more complex problems of people's lives, and sidelines "*varying local definitions of sustainability*" (ibid.). Hobson (2002) asks, "*Are there other stories and less privileged narratives to be heard, which offer alternate framings of sustainable consumption?*"

In trying to answer this question the following section examines what is required, and how to proceed, if we want to expand the design space within sustainable HCI.

Expanding the scope of sustainable HCI

DiSalvo (2009) and Sengers et al. (2009) argue that, in order to move beyond behaviour change for individual consumers, what is required within sustainable HCI is a fundamental rethinking of design, and an understanding and shift in cultural thinking (DiSalvo et al. 2009; Sengers et al. 2009). One way to do this is to look at alternative discourses of sustainability. For example, Hobson (2002) writes of alternative discourses that look at a sustainable society that links environmental sustainability and social justice:

Rather than linking up efficiency, science and the consumer through voluntary market mechanisms, as the rationalisation approach does, sustainable society discourses link up the moral citizen and personal experience with networked communities that range from global to local, through varied forms of overt and discrete social action Sustainable living is no longer just about consuming products but about how social and environmental resources of common good(s), spaces, networks, futures and relationships need to foster respect for each other and in turn, for the environment. In this sense, the environment is not (just) about 'nature', but about the total environment of lived spaces and daily experiences, the urban experience that is part of modern environmental histories. (Hobson 2002)

Hobson acknowledges, however, that because these are “*experientially and politically focused discourses that introduce the concepts of fairness and justice into future-orientated perspectives*” (ibid.), their proponents are often seen as subversive and anti-government and may flounder from lack of support and resources.

Others within HCI also argue for more holistic understandings of sustainability to include environmental, social, economic (Hirsch et al. 2010) and personal needs (Knowles et al. 2013). Expanding our understanding to “*embrace more contemporary, more holistic and more radical understandings of sustainability*” (ibid.) would result in new research questions such as: How can we enable less carbon-intensive social practices? How can we enable the delivery of best-practice knowledge for efforts such as local farming, local building, etc.? How can we help foster cohesion in local communities? How can we enhance values that are conducive to teamwork in order to enable local initiatives by communities (ibid.)?

Emerging research into sustainable HCI has offered a number of suggestions and possible directions to include other discourses and understandings of sustainability and thereby expand the design space of sustainable HCI, for example by including users in the design process through Participatory Design (Brynjarsdóttir et al. 2012), thereby allowing for user-led innovation (Choi & Blevins 2010).

Pierce et al. (2013) look at sustainable everyday practices, while Håkansson and Sengers (2013) try to gain a better understanding of lifestyles that are already less energy-intensive, such as simple-living families. Everyday practices may “*allow us new means to investigate the dynamics of (un)sustainability*” and help to “*expand beyond human–computer ‘interactions’ to grapple with the complexities of sustainability in terms of how people go about their everyday lives*” (Pierce et al. 2013). Another suggestion has been to move away from the focus on the individual to consider communities and designing at scale (Dourish 2010; Boucher et al. 2012; Aoki et al. 2009;

Ganglbauer et al. 2013). A shift from prescriptive to reflection “*may encourage users to reflect on what it actually means to be sustainable in a way that makes sense in the context of their own lives*” (Brynjarsdóttir et al. 2012). For example, Jacobs et al. (2013) describes a system for reflection on complex climate change data without prescribing a right or wrong way of interpreting that data. DiSalvo et al. (2009) suggest that ecologically engaged art can help inform reflection on sustainable HCI. Ganglbauer (2013) use an activist lens to understand sustainability in HCI, while Baumer and Silberman (2011) argue that a more effective way of protecting the environment than designing smartphone apps to change individual consumer behaviour is through educational programmes, information panels and community outreach.

Another suggestion for expanding the design space of sustainable HCI is to focus on agriculture, as farmers are among the first to be affected by climate change (Hirsch et al. 2010), and food impacts heavily on sustainability and therefore presents opportunities to examine some of the cultural, economic, social, environmental and personal complexities discussed above.

Furthermore, studying grassroots, urban and small-scale agricultural communities presents opportunities to answer calls within sustainable HCI to move away from a focus on individuals to scale (Aoki et al. 2009; Dourish 2010), and from models of competition to cooperation (Dourish 2010; Boucher et al. 2012). For these reasons I now turn to a discussion on food and sustainability, with a particular focus on small-scale urban agricultural communities, which provides the context for my research.

Food and sustainability

Food is an area that impacts heavily on sustainability, with global warming having imminent consequences for food – the vital foundation of human sustenance (Food and Agriculture Organization of the United Nations 2008). Sustainability, here, is about “food security”: stable availability and access to

quality food (Food and Agriculture Organization of the United Nations 2010). However, current global food production and consumption practices seriously threaten our food security for the future (Food and Agriculture Organization of the United Nations 2008).

A focus on food presents opportunities to explore the critical interrelations of the social, economic and environmental factors that impact on sustainability (Hirsch et al. 2010; Odom 2010). For example, there are social, economic and environmental implications of “food miles” – that is, the distance food must travel from the site of production to the site of consumption. The proportion of emissions generated from sections of the food chain after food leaves the farm is larger in high-income countries than in lower-income countries, and these emissions make up some 50% of food system emissions in the UK (Garnett 2011). Agricultural and food produce accounts for 28% of goods transported on UK roads and costs £2.35 billion a year (Pretty et al. 2005). It is estimated that the global food system produces a third of all greenhouse gas emissions, while about a third of all food produced is lost in the food supply chain (CGIAR).¹

Urban agriculture

Urban environments are the fastest-growing form of human habitat around the world, with 60% of the world’s population expected to live in cities by 2030 (UN Population Fund 2007). Issues around the consumption and production of food in urban centres have become a major concern. A report issued by the World Health Organisation (Petts 2001) on urban agriculture in London found that the city requires the equivalent of the entire productive land area of Britain to sustain itself. The report concludes that the ways in which London’s residents feed themselves are fundamentally socially, economically and environmentally unsustainable (Petts 2001). Food security in urban centres is

¹ The Consultative Group on International Agricultural Research (CGIAR) is a global partnership that unites organisations engaged in research for a food-secure future: <http://www.cgiar.org/> (accessed 30th May 2014).

also a growing concern where “*access to affordable healthy food which meets with cultural or religious dietary requirements may be a key issue in deprived urban areas with large ethnic minority populations*” (Bagwell 2011). In Tower Hamlets, the East London Borough where my research takes place, 76% of households are within a 10-minute walk of a supermarket, but 97% are within a 10-minute walk of a fast food outlet (Caraher et al. 2009). The same borough has a higher-than-average incidence of diabetes and has one of the highest childhood obesity levels in the country (Tower Hamlets Public Health Brochure).

Local food systems are a logical and appropriate way to increase the environmental, social, spiritual and economic well-being of a community (Feenstra 1997). And indeed, communal and individual food-growing practices in UK cities are a rapidly growing phenomenon. The number of community gardens in England in 2010 was four times greater than in 2005 (Milbourne 2012). Allotment growing is thriving in Britain, with demand far outstripping supply (McKay 2011). UK has a history of food growing through allotments, a system of allocating plots of land to citizens. While historically these provided individuals with opportunities to grow food, they have now evolved into “*an increasingly complex and dynamic part of contemporary life*” (Crouch 2003). The UK also has a tradition of radical gardening, of people coming together in cities to grow food in a politically motivated attempt to assert independence from the systems of control and consumption, and to defy the plans and laws of rulers, landowners, urban designers and decision-makers. As McKay (2011) has shown in his book on radical gardening, this tradition usually involves the reclamation of disused, abandoned or vacant land, which is then turned into fertile growing space in a collective spirit and usually with the help of community activists and artists. Spitalfields City Farm, the site of my research, is one such community. A community garden offers opportunities to resist the alienation caused by living in the “society of the spectacle” and late capitalism. As McKay writes,

Climate change, peak oil transition, community cohesion, the environment, genetic modification and food policy, diet, health and disability – the garden is the local patch which touches and is touched by all of these kinds of major concerns, whether it wants that kind of attention or not. (McKay 2011)

In a world where seeds are copyrighted and subject to licence, even saving and sharing seeds can be seen as a radical act. Local food systems, Feenstra (1997) argues, are a way to improve community food security, which is more than simply about access to food. Community food security is about “*a community-based, prevention-orientated framework that includes empowerment of community members, economic development strategies and more direct relationships between producers and consumers*”. Local food systems are “*rooted in particular places, aim to be economically viable for farmers and consumers, use ecologically sound production and distribution practices, and enhance social equity and democracy for all members of the community*” (ibid.). This suggests that studying local food systems provides opportunities for answering the calls within sustainable HCI to shift the focus from consumption to production (DiSalvo et al. 2010), from individuals to collective action (Ganglbauer et al. 2013; Boucher et al. 2012), citizenship and community (Baumer & Silberman 2011; Hirsch et al. 2010), and from competition to cooperation (Dourish 2010).

For a metropolis of its size, London is a remarkably green city. According to the Greater London Authority, 63% of London’s 160,000 hectares is made up of green space, or water. Of this, one third is private gardens, one third parks or sporting grounds, and the remaining third wildlife habitats. But despite an increasing interest in food growing, most of this green space is still either private property or laid out according to the designs and visions of experts and policymakers and not by the people who use the land. There is still only a very small proportion of the green space in London that is used for agriculture. However urban food-growing initiatives by local authorities in the UK are

enjoying a resurgence (Martin & Marsden 1999), for example through the Capital Growth 2012 initiative, which supported the creation of 2012 new community food-growing spaces in the capital by the end of 2012.

Sustainable HCI and small-scale food production

It is not surprising, then, considering the increasing popularity, demand and importance of community food growing in urban centres around the world, that within the field of sustainable HCI there is a nascent area of research into sustainable food practices, with a particular focus on small-scale and urban agriculture. This research is concerned with the practices, values and needs of food-growing communities, and opportunities for digital and information technology to support the move from individual consumers to small-scale producers of food. This research was highlighted at a number of recent CHI, UbiComp and Interact conference workshops and panels (e.g., “Green Food Technology: Ubicomp opportunities for reducing the environmental impacts of food” (Clear et al. 2013); “Urban Agriculture: A Growing Field of Research” (Lyle et al. 2013); “Hungry 24/7? HCI design for sustainable food culture workshop” (Choi et al. 2009); a panel on “Making Food, Producing Sustainability” (Hirsch et al. 2010), and in the book *Eat, Cook, Grow: Mixing Human–Computer Interactions with Human–Food Interactions* (Choi et al. 2014)).

Focusing on small-scale and urban food producers presents opportunities to expand the design space of sustainable HCI because it allows researchers to take a more holistic view of sustainability and to consider the critical interrelations of environmental, social and economic factors. Due to the increasing popularity, demand and importance of community food growing in London and other urban environs the designing of interactive systems to support such sites and communities has the potential for impacting on a number of pertinent issues such as food security and food waste, social inclusion, urban sustainability and healthier local economies.

Small-scale food producers produce 70% of humans' food, and, as food growing is so dependent on the weather, these are amongst the first to feel the impact of climate change (Hirsch et al. 2010). Choi and Bleviss (2010) articulate the virtues of researching food production and consumption within the context of HCI, with a focus on designing for more environmentally, socially and economically sustainable cultures (Choi et al. 2009). Bleviss and Morse (2009) look for opportunities for interaction designers to design systems for sharing knowledge of sustainable food growing, including within urban agriculture. A focus on food could expand the design space by offering opportunities to examine our cultural assumptions, as Dourish (2010) and DiSalvo et al. (2010) argue we should be doing. For example, in the specific context of food production and consumption, the relatively recent separation between agriculture and the city is, according to Kaasa and Rolf (2007), "*steeped in the cultural narratives of modernism*". These narratives have included: the conceptualisation of natural resources as unlimited, the belief that technological solutions come without side effects, and the idea that nature and natural processes are somehow dirty and undesirable (ibid.). Choi et al. (2014) in their book *Eat, Cook, Grow: Mixing Human–Computer Interactions with Human–Food Interactions* argue that by looking at urban food practices we must find ways to shift the current configurations of how we eat, cook and grow food toward more healthy, socially inclusive and sustainable food futures, and that such futures will engender "*new forms of urban networks and experiences*". While urban and community agriculture allows us to broaden our understandings of sustainability, Hirsch (2014) acknowledges that such practices are highly localised and therefore the ways in which sustainability is conceived are highly dependent on local context.

Urban and small-scale agricultural case studies

There are a number of new technological designs that incorporate digital technology to support the needs and values of urban and small-scale food-growing communities. For example, there has been a plethora of

commercially available sensor-based products that help gardeners and urban farmers manage the watering needs of their plants by sending alerts to smartphones,² automatically watering thirsty plants (Re:farm the city³), or offering an online community of supportive windowsill farmers (Difranzo & Graves 2011). Small-scale and urban agriculture is an emerging area of interest within HCI. Patel et al. (2010) describe an interactive voice application for small-scale farmers in rural India to provide interactive, on-demand access to appropriate and timely agricultural knowledge. Seeds to Soil (Tran 2011) is a grassroots urban food-growing project in Central Harlem that uses participatory actions and an online presence to address issues around community cohesion and food security. Visitors to a community garden can plant and take home a mystery seed, before joining an online community where they can share information about their plants with people they have never met before, but who may be their neighbours. Norton et al. (2014) describe an online system to support the design and creation of backyard agricultural ecosystems. Odom (2010; 2014) and Lyle et al. (2013) explore the values, needs and practices of urban agricultural communities in Australia and describe opportunities for designing with digital and computational technology to support these communities through information displays and seasonality apps, thereby extending the scope of sustainable HCI. Hirsch (2014) presents a framework for thinking about the different design opportunities urban agriculture presents by providing a case study of a community garden in Portland, Oregon.

What ties these projects (save Patel et al. 2010; Norton et al. 2014) together is that, in contrast to the majority of works surveyed in DiSalvo et al. (2010), they all involve collective action, user-led innovation, and participatory processes. They challenge the position of the user as an individual consumer

² For example, the Parrot Flower Power: <http://www.parrot.com/usa/products/flower-power/> (accessed 12th June 2015).

³ <http://www.refarmthecity.org> (accessed 12th June 2015).

whose contribution to the ecological crisis is reduced to moral decisions about what to buy. They challenge the traditional roles of designer and user by engaging in Participatory Design practices, drawing on the knowledge of the communities, rather than the beliefs of the designer. And they approach the subject of sustainability from a grassroots position. As Choi and Blevis (2010) argue, there is the possibility of transformations in sustainable behaviours when they are “*incremental and self-initiated as opposed to abrupt and externally enforced*”.

However, all these projects also have another thing in common: they see opportunities for technological intervention to support the work of educational, outreach, and communication, which are essential to urban agricultural communities. In this way they answer the call from Choi and Blevis (ibid.) to use computing “*to find efficient and engaging ways to utilise technical resources to allow for collaborative information sharing, knowledge production, and user-led innovation*”. My research extends this emerging field of research into grassroots small-scale and urban agricultural communities, by focusing on a city farm in inner East London. However, while my research also looks at ways to support the educational, outreach and communication aims that grassroots urban agricultural communities have in common, I question the need for *efficiency* in the resulting technological interventions. In order to explore alternatives to efficiency-based solutions, I draw on open-ended non-utilitarian approaches from the third wave. In particular, I focus on ludic design, which has typically been used within HCI to disrupt the dominant narratives of efficiency and productivity to raise questions and provoke new perspectives on serious issues such as environmental concerns.

Non-utilitarian approaches from the third wave of HCI

Design “manifestos” (Bowers 2012) such as *ludic design* (Gaver 2002), *reflective design* (Sengers et al. 2005), *slow technology* (Hallnäs & Redström

2001; Odom, Banks, Durrant et al. 2012), and *critical design* (Dunne & Raby 2001; Dunne & Raby 2013) have emerged within HCI as alternatives to traditional task-based and efficiency-focused ways of designing interactive systems. These design philosophies can be characterised as stemming from the third wave in HCI (Bødker 2006), which follows the move away from work-based systems and into the home and all aspects of our lives, and can also be traced to the development from desk-based computing to mobile and ubiquitous computing (Bowers 2012). While the first wave of HCI focused on interactive applications running on workstations for individual users, the second wave of HCI was critical of the ergonomics and software engineering tendencies of the first wave for not taking into account the social identity and organisation of the user. Computer Supported Cooperative Work (CSCW) as a research field is cited as stemming from second-wave HCI concerns (ibid.). The third wave of HCI is characterised by non-work situations and areas of concern such as lived experience, culture, emotion, intimacy and pleasure (Bødker 2006; Bardzell & Bardzell 2011).

These changes in HCI have resulted in new perspectives and a need to move away from more task-based, efficiency-focused problem spaces that were typical of the first and second waves. Innovative, creative approaches to the design and conception of digital systems are called on, often drawing on methods from art and design. Within these new design perspectives, ambiguity (Gaver et al. 2003) and flexible interpretability (Sengers & Gaver 2006) are valued as resources, rather than something to be eliminated.

In this section I present an overview of these non-utilitarian design perspectives. In particular, I focus on ludic design as it incorporates the values, principles and strategies of the other approaches described below. Furthermore, I have decided to frame my research through design case studies described in Chapters 5 and 6 as ludic, because this fits most closely with my own experiences and sensibilities as an artist/designer. I have explained my rationale for this in greater detail in Chapter 3.

Designing for reflection

While designers and researchers have moved away from designing solely for the workplace, they often unconsciously bring workplace values such as efficiency into our homes and leisure activities (Sengers & Gaver 2006).

Reflection in design is used to uncover and change the limitations of existing practice as well as to examine our unexplored assumptions and values as a way of understanding what gets marginalised in HCI (Sengers et al. 2005).

Methods are developed to bring these marginalised practices into the centre, which in turn stimulates debate on the activities and values that HCI should support. In this way it can help expand the design space of HCI.

Designers can use reflection to understand the values and experiences of their own that they bring to the table, and support users to reflect on their own lives, values and experiences. Scepticism from users about technology is seen as a healthy and desirable quality, as it allows users to feel empowered to reappropriate technology for their own ends. Reflective design recognises that a dialogic engagement between designers and users can support reflection and that through such dialogue we can learn about existing limitations and future possibilities of design.

Sengers et al. (2005) developed a systematic approach to folding critical reflection into technology design, in order to address the blind spots that are so naturalised that they make it difficult to see another way of doing design in HCI. Strategies for incorporating reflection include providing for interpretive flexibility (discussed in greater detail below), which means that users can maintain control and responsibility of the meaning-making process. Ways to do this include defamiliarisation (Bell & Sengers 2005), using ambiguity as a resource (Gaver et al. 2003), and building systems in which reflection is an intended part of the final experience. Another strategy is to give users licence to participate. This can be done by providing bridges from the familiar to the unfamiliar, for example through playfulness to make people feel included, or through grounding the strange in the familiar. A third strategy of reflective

design is to inspire rich feedback from users, because reflective design “*encourages making evaluation and reflection an inherent part of the design, not merely a step added on at the end*” (Sengers et al. 2005). The evaluation itself can inspire users’ reflections, which can provide valuable feedback.

Designing for multiple interpretations

There is agreement in many areas of HCI that it is possible and desirable to design a system with one correct way of interpreting it and that any ambiguity should be resolved (Sengers & Gaver 2006). The goal of the designer is to convey that interpretation to users. Evaluation is a measure of the interpretation that designers intended, taken up by users. Any differences between the users’ interpretation and the intended one is seen as a problem that counts against the success of the design, the solution to which is to decide on the correct interpretation and to design for agreement.

However, as Sengers and Gaver (2006) argue, sociology of technology has shown us that even when it is possible to design for a single interpretation, this comes about through complex, protracted negotiations of social groups. Furthermore, as HCI moves out of the workplace it is becoming more personal, broader and more “*idiosyncratic*”, and therefore designing for a singular interpretation of use may not be possible nor desirable. Finally, there is a recent growing interest within HCI in perspectives from the arts and humanities which assume a broad range of interpretation beyond usability and utility. For these reasons, Sengers and Gaver argue that HCI can and should systematically design and evaluate for multiple, sometimes conflicting, interpretations.

The advantages of designing for multiple interpretations include that it allows for varied perspectives and meanings to exist simultaneously in relation to a single system without conflict. It allows for many individual users to derive their own personal meanings from the same system, in relation to how they experience and act in the world. It may be more applicable to non-work-

related technologies characteristic of the third wave of HCI that would be undermined by a strong authoritative narrative, thereby allowing designers to raise subjects of concern without imposing their views (Gaver et al. 2010). Another affordance of reflective design is that people will be more actively engaged in making sense of a system and take more responsibility for interacting with it if they are allowed a substantial role in determining its meaning (Sengers & Gaver 2006).

Designing for ambiguity

As discussed above, traditional task-based systems aimed to eliminate ambiguity so that the designer could control the response, use, interpretation and experience of the user. Gaver et al. (2003) argue that, rather than viewing ambiguity as something to be eliminated, it can be seen as a resource and an opportunity to be utilised, and designed into systems from the outset in order to support multiple and personal meaning-making.

Designing ambiguity into a system allows for people to fill in the gaps, and therefore to find their own interpretation and develop deeper and more personal relations with the meanings offered by those systems.

If people are to find their own meaning for activities, or to pursue them without worrying about their meaning, designs should avoid clear narratives of use. Instead they should be open-ended or ambiguous in terms of their cultural interpretation and the meanings – including personal and ethical ones – people ascribe to them. (Gaver et al. 2004)

In other words, the authors believe that ambiguity can help users make connections and create their own meanings. Ambiguity impels people to question the truth of a situation. “*When successful, this mingling of discourses disrupts easy interpretation of the design, and obliges users to work out ways to make sense of the new situation*” (Gaver et al. 2003). The authors explain that ambiguity may arise from a user’s personal relationship with a system, and that such ambiguity is aimed at producing self-examination of “*how we*

might personally use such products, and what our lives would be like in consequence" (ibid.). Ambiguous systems allow people to re-evaluate their beliefs, values and attitudes, to consider new ones, and to interpret and evaluate the meaning they might have for them personally. The results of this speculation help us "*form intellectual, aesthetic, emotional, and moral judgments that can become available for self-reflection. The result of this process can be experiences that are uniquely personal: delightful, disturbing, or both*" (ibid.). Like many works of art, ambiguous systems can evoke experiences of delight, intrigue, mystery, aesthetic meditation, pleasure and curiosity. They can be compelling, thought-provoking and provocative. However, the same systems may also arouse feelings of disorientation, ambivalence, discomfort, frustration and confusion.

Tactics for introducing ambiguity include: using deliberately imprecise representations to emphasise uncertainty and require users to fill in the gaps; overinterpreting data to encourage speculation to draw attention to possible truths; juxtaposing incompatible elements to create a space of interpretation in which users can build their own meanings; bringing together incompatible contexts as a way to create tension and provoke users to rethink their basic assumptions; adding new, incongruous functions to familiar designs within existing genres; pointing things out without explaining why in order to "*draw attention to overlooked aspects of the environment to encourage reflection on their significance*" (Gaver et al. 2003); and introducing disturbing side effects in order to question responsibility, which may cause us to reflect on the trade-off of moral principles.

Slow technology

Slow technology (Hallnäs & Redström 2001) is a design agenda for information technologies aimed at reflection and mental rest over long periods of time, rather than fast and efficient tools to be used during a limited time in specific situations. By favouring reflection and contemplation, pleasurable experiences and personal meaning-making over clear interpretations of use,

slow design provides an antidote to the efficiency and productivity values of traditional HCI. The slow technology agenda aims to actively “*promote moments of reflection and mental rest in a more and more rapidly changing environment*” (ibid.). Fast technology can be defined as “*efficiency in functionality with respect to a well-defined task*” (ibid.). It aims to save, or take away, time. Slow technology, in contrast, by opening up a space for reflection, creates time, or makes time more present. “*It is not technology for compressing time to do given tasks, but technology supplying time for doing new things. It is technology that is useless for fast and impressive demos; to see what it is takes time*” (ibid.). Like music, or a piece of art, slow technology stretches time, slows things down. It can also amplify environments in space and time, to make them bigger. One example that the authors give of slow technology is that of *soniture*, which refers to the sound equivalent of furniture: the movable things in a room that produce its sounds. Soniture can be a clock ticking, a fridge humming, chairs scraping the floor, but also people moving and talking. “*Using the sound as a central property of material amplifies the presence of things and makes learning and understanding slower*” (ibid.). Slow technology can design soniture using new technology to amplify and redefine an environment.

Since Hallnäs and Redström produced their seminal paper, the slow technology agenda has expanded in new directions and taken on new relevancies, particularly within sustainable HCI. For example, it has been used to ask how we can design to slow down the consumption of technology by prolonging its use and reuse (Odom, Banks & Durrant 2012; Pierce & Paulos 2011) and thereby addressing the trend of planned obsolescence that contributes to unsustainable levels of e-waste. Also, how might we design systems and technologies for multiple lifespans and to take into account future generations (Friedman & Nathan 2010), and how can we design for slowness and reflection when attempting to understand difficult climate change data that span thousands of years (Jacobs et al. 2013)? Cow-Cam.tv

(Bissas & Agamanolis 2012) describes slow technology to explore our connection with nature, and to provide space for “*contemplation and reflection on one’s urban routine and ... a reconnection to something of value that was perhaps forgotten*” (ibid.).

Critical design

Critical design aims to encourage reflection and introduce new ways of looking at the world and the role that designed objects can play. It was developed by Dunne and Raby (2001; 2013) who have described it as an attitude towards design that sets itself apart from affirmative design – i.e., design that affirms the status quo – by challenging assumptions and preconceptions about the role that products play in everyday life. Its main strategy is provocation, in order to raise awareness and spark debate.

Critical design also uses the strategy of value fictions, which is a cultural thought experiment that imagine existing technology in the service of implausible social values and goals. For example,

In the case of the Dawn Chorus, the value of human dominance over animals is embodied in a personal, living music box. The extremity of this design provokes reflection on our existing practices of domination over nature and the role of technology in this drive. (Sengers et al. 2005)

Some criticisms of critical design are that it can backfire and alienate people who do not get the subtle irony (ibid.). Others have complained that this design attitude lacks guidelines on how to do it well, and that its central concepts and methods are difficult to adopt (Bardzell & Bardzell 2013; Bardzell et al. 2012).

Ludic design

Developed by William Gaver, first at the Royal College of Art, and then with colleagues at Goldsmiths, University of London, ludic design is based on the

idea of Homo Ludens – that humans are essentially playful creatures (Huizinga 1955). Ludic activities such as browsing through a book, taking an aimless walk or admiring the garden can provide the mechanism with which to develop new values and goals, see things in a fresh light, and learn new things. *“Play is not just mindless entertainment, but an essential way of engaging with and learning about our world and ourselves”* (Gaver 2002).

Gaver has used these insights to provide, through the design of ludic encounters, an antidote to the dominant narratives of utility and productivity, challenging the idea that technology *“should provide clear efficient solutions to practical problems”* (ibid.). Ludic design allows designers and researchers to examine the assumptions that are brought to research projects. Ludic designs use exploration, curiosity, surprise, reflection and wonder as useful tools for providing new perspectives on complex and serious issues, such as environmental concern. As Gaver argues,

it should be clear that [ludic designs] go beyond mere entertainment They raise these issues, but don't provide answers. Instead, they offer ways for people to experience life from new perspectives, thereby testing hypotheses about who we might be or what we might care about.

Ludic designs de-emphasise the pursuit of external goals, for they are by definition non-utilitarian: if a system can easily be used to achieve practical tasks, this will distract from the possibilities it offers for more playful engagement. Instead, they provide opportunities for appropriation over consumption, pleasurable experiences over efficiency, and ambiguity rather than clear narratives of use. Ludic design aims to provoke *reflection* and *open-ended interpretation* (Sengers & Gaver 2006) through the use of *ambiguity* (Gaver et al. 2003) and in this way open up new perspectives within HCI.

How can ludic design help expand the design space of sustainable HCI?

Ludic design offers opportunities for both users and designers to reflect on the limitations of sustainable HCI, on our preconceived ideas of what sustainability means and how such assumptions influence the design space. By disrupting the reduction of sustainability to singular narratives of efficiency and productivity, it may help answer calls within sustainable HCI for designers to examine the underlying sociocultural, economic and political factors that influence design (Dourish 2010; DiSalvo et al. 2009), and for broadening our approach to tackling the global environmental crisis, as well as raising questions about how we understand society, and our role in it as consumers and makers of things (DiSalvo et al. 2009) without providing the answers. It may help address the alienation that target users experience with systems based on simplified discourses of sustainable consumption that fail to incorporate the complexities of everyday life (Hobson 2002).

Designing for ambiguity and multiple interpretations “*frees users to react to designs with scepticism or belief, appropriating systems into their own lives through their interpretations*” (Gaver et al. 2003). This means that they don’t have to take at face value the authority of the system or the designer; they can question it and react to it with scepticism. By not trying to control the outcome, designs that embrace ambiguity and support reflection and multiple interpretations may answer the call for more reflective and less prescriptive design, and therefore address the limitations of authoritative and top-down solutions that are inherent in persuasive sustainability (Brynjarsdóttir et al. 2012). As Brynjarsdóttir et al. argue, a shift from prescription to reflection “*may encourage users to reflect on what it actually means to be sustainable in a way that makes sense in the context of their own lives*”. Rather than alienate its intended users, as many persuasive sustainability designs do (Hobson 2002), ludic designs provide opportunities for reflection and personal meaning-making of design objects that deal with environmental concerns, and

can “lead to a deep conceptual appropriation of the artefact” (Gaver et al. 2003).

Ludic designs encourage reflection on the meaning of the designed artefact and its environments, “aesthetically, culturally, and – especially – personally” (ibid.) and in this way may help to answer the call to incorporate alternative discourses of sustainability that include a focus on the personal (Knowles et al. 2013).

Examples of ludic design

In this section I present well-documented examples of ludic design from Gaver’s Interaction Research Studio at Goldsmiths, University of London. I also present some lesser-known examples from the literature that highlight how ludic design addresses serious issues.

The History Tablecloth (Gaver et al. 2006) is a flexible layer placed on top of a domestic table that lights up in a lace-like structure when objects are placed on it. The lights appear like a halo around the objects, growing over a period of hours and fading when the object is removed. It does not suggest a single interpretation of use or meaning; rather, it encourages reflection about the flow of things through the home, without suggesting the implications of this movement or what this says about its inhabitants’ values or lifestyle. As Gaver et al. explain,

The interpretation of that situation is left to the people who encounter the Tablecloth. Some might feel that it is a prompt to tidy up more often, others might become reluctant to move objects on the table lest they disrupt a particularly pretty pattern of lights. (ibid.)

By leaving the more personal aspects of interpretation – what does this mean for me, as a person? – explicitly open, systems such as the History Tablecloth may support richer, more personally meaningful, and even more correct interpretations than they might explicitly be able to model or present. (Sengers & Gaver 2006)

The History Tablecloth uses ambiguity of relationship by creating a system that clearly relates to external situations without indicating a judgment about their meaning (Gaver et al. 2006).



Figure 1: The History Tablecloth

The Drift Table is another well-documented example of a ludic design that employs ambiguity to open new design spaces for the home. It is an electronic coffee table that displays slowly moving aerial photography controlled by the distribution of weight on its surface. It is not clear what the Drift Table is for, and it does not communicate a single correct interpretation of use or meaning. It is open-ended and ambiguous. What it is good for, and how people could use it in their everyday lives, is left up to users (Sengers & Gaver 2006).



Figure 2: The Drift Table

Relating more closely to our topic of sustainability, the Indoor Weather Stations are three related devices that reveal indoor microclimates and present curious systems for reflection and exploration about domestic space and to encourage multiple perspectives on the environment (Gaver et al. 2013).



Figure 3: The Indoor Weather Stations

In the Wind Tunnel a small wind sensor detects the almost imperceptible wind currents of the home and controls a fan that blows gusts through a forest of tiny paper film trees. The Light Collector shows a history of the changing

ambient light colour in the home. The Temperature Tape gives people a sense of temperature gradients within the home. The artefacts were designed to “*complicate simple narratives of responsibility and disrupt a dogmatic logic of self-sacrifice*” (ibid.), thereby opening up new spaces in sustainable HCI. They do this by encouraging reflection on people’s relationship with the environment but without prescribing a right or wrong way of understanding the devices and what they mean.

The Indoor Weather Stations resemble ambient awareness systems that help visualise environmental data, such as the Watt-Lite (Jönsson et al. 2010) and the Power Aware Cord (Gustafsson & Gyllenswärd 2005). All three examples are somewhat playful and aim to provide ambient feedback based on measurable data. However, the latter two aim to persuade the user to behave more sustainably when prompted by the information provided by the system, and in this way they reinforce rather than subvert the dominant narrative of efficiency and productivity of sustainable consumption. On the other hand, the Indoor Weather Stations (Gaver et al. 2013) aim to subvert this dominant narrative of sustainable consumption by provoking questions about their use and meaning, without providing any clear answers.

In any case, Gaver et al. (ibid.) document the difficulty of avoiding clear narratives of use even when this is the aim. For example, they write of how users were automatically geared towards interpreting the devices as somehow benefiting the environment:

an environmental narrative implying that the devices might offer some benefit with respect to concerns about ecological issues still oriented people’s criteria for the success or failure of the Weather Stations. It seemed that raising environmental issues as a context for our designs, even negatively, brought into play a host of assumptions about how designs might properly be expected to address such issues. Thus many of our participants oriented to the

devices' potential utility as, e.g., draft detectors or indicators of energy waste due to excess lighting or heating. (ibid.)

This highlights the difficulties of designing successful ludic designs to subvert dominant narratives of efficiency and productivity within the context of sustainable HCI.

While the ludic designs discussed above present playful encounters with domestic technology, ludic design has been used to address serious issues in more social and public space contexts. For example, it has been used as a way to challenge stereotypes and negative representations of care homes and the older old (Blythe et al. 2010). Chirumamilla and Pal (2013) use ludic design as a way to counter the dominant “*developmental-optic*” of ICTD projects, which refers to the typical way in which the members of the primary user audience of such projects are seen as backward and in constant need of improvement as decided on by a Western other. By designing for “*non-productive*” activities and desires, researchers can begin to reimagine the discursive frame in which their projects operate. For example, by incorporating entertainment, fun and games into serious agricultural and learning content researchers can design for appropriation and empowerment, rather than “*improvement*”.

We think here of play as a lens through which empowerment can be perceived, since opening something to play creates a more comfortable, and perhaps more mutually respectful, environment in which users can appropriate a technology in their own terms without the weight of the self-proclaimed “seriousness” of the development agenda. (ibid.)

The authors argue that ludic design is a strategic move to recognise that people have various needs, and that these needs are important even if they are in conflict with what the developmental optic sees the community as deserving. It acknowledges that “*lives on the ground are often far more dynamic, far more complicated, than the rhetoric of development makes them*

out to be". Thinking seriously about play presents a way out of the constraints of the dominant narrative of development in such a way that researchers and designers can begin to expand the view of their users as simply needing improvement, and to begin to recognise the complexities of the worlds they live in and how to contribute to them, in both productive and "*non-productive*" ways (ibid.).

Another example is the Dawn Chorus (Gaver et al. 2000), a bird feeder that teaches local songbirds new melodies. This ludic design provokes reflection about ethical questions of taming nature and the role of technology in this drive. Although ludic and critical design have been used interchangeably when describing projects such as the Dawn Chorus (Gaver 2002; Sengers et al. 2005), Sengers et al. (2005) argue that ludic design is more playful than critical design, and it does not suffer the same criticism that it preaches to users and ironically bypasses them.

Challenges and limitations of non-utilitarian design approaches

Non-utilitarian design perspectives that see ambiguity as a resource and that provide for reflection and open-ended interpretation present significant challenges and limitations, and they have been subjected to critique from within HCI. For example, when we are no longer evaluating for a single authoritative interpretation we can no longer measure how well a user's interpretation matches the intention of the designer. One danger is that every system will be declared a success because every system can generate multiple interpretations. As Sengers et al. (2005) argue, designing for reflection does not include an a priori benchmark of what works. The challenge is to allow for multiple meanings and uses, but to still be able to "*identify when and how a design has failed*". And, as Sengers et al. argue, designers still have a responsibility for the success of those systems, but new methods may be needed to be able to do this.

Evaluation is also an interpreted task; therefore, one way to evaluate is to include multiple interpretations of the evaluation process. Users'

interpretations of their experiences using the system can be incorporated into the evaluation, as can the evaluative interpretations of art critics, journalists, filmmakers and others from outside the field of HCI. One way to evaluate is to ask how many interpretations were generated and why. Do users feel stimulated and empowered to develop their own interpretations? Such evaluations can present potentially conflicting assessments. The task of evaluation, therefore, becomes that of identifying, coordinating, stimulating and analysing the different and potentially conflicting evaluations.

Another challenge for designs that use ambiguity as a resource is finding “a *sweet spot between banality and incomprehensibility*” (Gaver et al. 2013); if the devices are either too strange or too familiar they will fail.

In order to provide a context for the second of my overarching research aims (described in Chapter 1) – namely, involving non-“expert”-led voices in the discussion around sustainability – I now turn to a discussion of approaches that have traditionally been used within HCI to include those who will be affected by a design in the design process.

Involving the user in the design process

At the beginning of this chapter I discussed the dominant narrative within HCI, which views the problem of sustainability in terms of sustainable consumption. This paradigm necessitates expert-led solutions that use technology to increase efficiency and productivity and support individual behaviour change. As elaborated on previously, one of the main problems with this framing of sustainability is that it fails to incorporate diverse voices into the discussion about what sustainability means, and how this should impact the design space. So how do we expand the design space to address the complexity of people’s lives, the varying understandings of sustainability and a diversity of voices? What methods should we use? Brynjarsdóttir et al. (2012) suggest that one way to move away from authoritarian and top-down expert-led

solutions that often alienate their intended users is to involve users in the design process.

HCI has various traditions of involving users in the design process, and of focusing on improving the lives of users. In this section I present a selection of these, including action research (Hayes 2011), experience-centred design (Wright & McCarthy 2010), user-centred design (Vredenburg et al. 2002), socially engaged art practice (Clarke et al. 2014) and Participatory Design (Robertson & Simonsen 2012).⁴ I describe in greatest detail Participatory Design, and, in particular, community-based Participatory Design (DiSalvo et al. 2012), because it provides well-documented methods, principles and commitments for engaging diverse stakeholders; it focuses on both the process and outcome; and it allows for creative and cultural production. In Chapter 3 I discuss in detail my rationale for and ways of using community-based Participatory Design in my methodology.

These design approaches that include the user in the design process reflect the limitations of more traditional software and engineering methods, the changing political and epistemological positions of designers and researchers in relation to the users of their designs, and the evolving nature of the design process itself.

Action research

Action research (Hayes 2011; Reason & Bradbury 2001) is a series of commitments to conducting collaborative inquiry with a participating community. It is concerned with improving social well-being, typically outside traditional workplace, desk-bound computing situations. It typically requires that researchers collaborate with the community to form research questions, analyse the data, and decide on the design. Where action research is used within HCI, knowledge and learning is produced through design research,

⁴ Although my thesis does not detail the arguments presented in McCarthy and Wright (2015), I am aware that this is a recent study and a relevant one to this discussion.

evaluated collaboratively, and fed back into iterative changes through cycles of reflection around action (Hayes 2011). It requires a commitment for people to be engaged equally at all stages and “*afforded the same consideration as...more traditional research collaborators*” (ibid.). Action research is committed to the goals of science. However, as it is about creating research efforts with people, not for or about those people, the research aims to find highly contextualised, localised solutions to real problems, and therefore the emphasis is on transferability rather than generalisability.

User-centred design

In contrast to more participatory methods such as action research, in which the “user” is more of a partner, a user-centred approach considers the “user as subject”. It has been most useful in designing consumer products (Sanders & Stappers 2008). The user-centred approach has been primarily US-driven, originating in the 1970s and widespread in the 1990s when designers were increasingly required to take into account the future users of their products and there was a resulting move towards defining products based on what people need.

Although user-centred design shares some methods and theories with other design approaches that involve the user in the design process, such as Participatory Design (described below), it lacks an agenda for social justice, and it is not based on democratic and emancipatory practice (Greenbaum & Loi 2012). Kensing and Greenbaum (2013) argue that, where participation is used as one-way data-gathering approaches where users are little more than informants in a “*process otherwise controlled by information technology designers and their clients/managers*”, as is the case in user-centred design, this cannot be considered the same level of “*genuine participation*” as that practised by proponents of Participatory Design because it does not share the same emancipatory aims (Kensing & Greenbaum 2013, p.27).

Experience-centred design

Wright and McCarthy (2010) describe experience-centred design, which has a humanist agenda and has evolved out of Participatory Design and user-centred design. Experience-centred design is based on ethical and political ideals of democracy, equality and choice. The focus is on the lived and felt experiences of those who will be affected by the designs. Designers aim to understand and design for the richness of human experience. Taking a dialogical approach to design means that the experiences of participants may be diverse and, sometimes, in conflict. Dialogue between self and other is understood as a process, and not in relation to static representations of individual people or groups (Clarke 2014). The focus is on enhancing people's lives, rather than reducing inefficiencies, improving productivity or serving brand identity. Within experience-centred design it is recognised that the designer is not just a facilitator, and that designers "*bring their own ways of seeing, values, sensibilities, and interest to the design process*" (Wright & McCarthy 2010, p.23).

Socially engaged art

There is growing interest in socially engaged arts practice within HCI as a way to understand complex societal challenges such as environmental sustainability (DiSalvo et al. 2009), education around climate change data (Jacobs et al. 2013), immigrant identities (Clarke et al. 2013; Björgvinsson et al. 2010) and aging populations (Light et al. 2009). Arts practices are used to problematise narratives of technological solutionism and determinism and to open up new questions and spaces about the future of technological design. At the same time, technologies are used as tools for creative expression, critical debate, and dissemination of project outcomes. Socially engaged arts practice aligns epistemologically with Participatory Design and action research, but foregrounds the ethics and aesthetics of sociocultural interactions (Clarke et al. 2014). It uses collaborative making through workshops, performances and events, engaging communities in creative and

generative ways. “*The intention of such work is to create more playful re-imaginings of the issues and possibilities associated with social change, in turn re-purposing and re-configuring the technology to offer alternative spaces and ideas for discussion*” (ibid.). As I highlight below, socially engaged arts practice within HCI shares many of the same epistemological, methodological, and political commitments as community-based Participatory Design, which also foregrounds creative and cultural production to raise awareness of matters of concern within diverse communities.

Participatory Design

Participatory Design presents a set of theories, methods and studies that have historically been used as a way to include more voices in the design process and to involve those who will be affected by the design in the decision-making process. In particular I focus on community-based Participatory Design as a way to include voices and groups not typically included in the design process within sustainable HCI. Community-based Participatory Design (DiSalvo et al. 2012) focuses on the relations of informal organisations and groups. It has been used to include marginal voices, empower communities, include users in the design process and focus on creativity and cultural production, which are all relevant to expanding the design space of sustainable HCI, particularly within the third wave. As Robertson and Simonsen (2012) write in their introduction to the *Routledge International Handbook of Participatory Design*: “*The political rationale for genuine participation in design reflects a commitment to ensuring that the voices of marginalised groups and communities are heard in decision-making processes that will affect them*” (p.6). Participatory Design seeks to share control with the end-user and is based on values of inclusion and enhancing people’s lives rather than reducing inefficiencies, improving productivity, or serving brand identity.

The first part of this section deals with the origins and purposes of Participatory Design. I then describe a more recent broadening out from work-

based Participatory Design to include the less formal relations and organisational structures of community-based Participatory Design. In order to tease out the particular issues, challenges and matters of concern for community-based Participatory Design, and to ground our understanding of “community”, I discuss the ways that “community” is discussed in the Participatory Design and HCI literature as well as drawing on other non-computing fields such as geography and social work.

Background

Participatory Design is a set of theories, practices and studies that grew out of Scandinavian labour movements in the 1970s, as a reaction to the ways in which computer systems were being introduced into industry to the detriment of workers. It originated in the moral, political and “communitarian” motivations of Scandinavian democracy, and was developed to try to improve the conditions of workers (Robertson & Simonsen 2012). Traditional software and engineering design methods that grew out of the need for increased efficiency and performance of workers have been criticised for becoming yet another tool of management to exercise control over workers, without incentive to improve workers’ conditions (Kensing & Blomberg 1998a). Participatory Design researchers became involved with the workers and developed a commitment towards them (Wright & McCarthy 2010; Sanders & Stappers 2008; Bødker 1996). In order to increase the chances that the different stakeholders, but especially the workers, will actually use the information and communications technologies in their own lives, Participatory Design practices engage these different stakeholders in the design process. This is the unshakeable commitment of Participatory Design: that those who will be affected by the results play a critical role in the design (Robertson & Simonsen 2012).

Other participatory methods were being developed elsewhere at the same time, such as in the US, similarly motivated by the desire to involve different decision-makers in the design process as a way of ensuring that systems

worked well and that users had a sense of ownership over those systems. Likewise, in the UK, participatory practices were being explored by researchers and designers, for example at a Design Research Society conference in Manchester in 1971 whose theme was Design Participation, and at which the futurist Robert Jungk suggested that “*we could talk not (only) about participation at the moment of decision but about participation at the moment of idea generation*” (in Sanders & Strappers 2008).

These different design approaches fall within the research traditions of Participatory Research and Participatory Action Research, which emphasise the participation of research subjects. Within these traditions, research can be by, for, and with the people who will be affected by it (Pain & Francis 2003; Greenwood & Levin 1998).

New perspectives and goals arose from these concerns that motivated Participatory Design research including: *Designing technological futures; Shifting roles and relationships; Process not just outcome; Dialogical perspectives.*

Designing technological futures

The main challenge for Participatory Design is how to give designers insight into workers’ lives, whilst also involving workers in the design process and “*thinking around possible futures*” (Wright & McCarthy 2010). Like other design fields Participatory Design is concerned with shaping future situations (Robertson & Simonsen 2012), and is therefore concerned with motivating and affecting individual, organisational and/or technological change (Vines et al. 2013). “*Design is, fundamentally, about designing futures for actual people*” (Robertson & Simonsen 2012). Traditional approaches have been criticised because their technically oriented descriptions of new systems provide few opportunities for users to make connections to their lives or to learn about possible technology futures (Kensing & Blomberg 1998a). In addition, traditional methods of report writing for design teams often fall short

of effective communication and create overly abstract representations of users and their environment (Kensing & Blomberg 1998a). Another key challenge is that people who are not professional designers may not be able to articulate what they want from a design if they do not know what is possible. Therefore, new methods and techniques were developed that could give insights into people's lives, as well as involve them more directly in the design process.

Other challenges result from the changing nature of the design process. Sanders and Strappers (2008) argue that traditional design disciplines such as product design, architecture, interior design and software design focus on the design of products. In contrast, emerging design disciplines such as interaction design, ludic design, experience-centred design, slow design, etc., focus on designing for a person's or societal need. They require longer views and involve a wider scope of inquiry, because "*we are designing for the future experiences of people, communities and cultures who now are connected and informed in ways that were unimaginable even 10 years ago*" (ibid.).

A traditional design process starts with a pre-design step, which includes a requirements study. This is followed by concept development and then an iterative prototyping process, which results in a product. However, as designers "*move closer to the future users of what they design*" (ibid.), the design process today has a growing front, fuzzy end. This process is messy, ambiguous and open-ended. It involves exploring and understanding the context, users and technological opportunities, without knowing if the outcome will be a product, service or interface.

"Designers in the future will make the tools for non-designers to use to express themselves creatively" (ibid.). If we look at the design process as long-lived and complex in scope, in which the users of 10 years into the future must be imagined, then the changing role of designers also becomes clear. Strappers and Sanders give the example of a new hospital build, the design of which may begin 8–10 years before it is opened. Designers, whose business

it is to keep abreast of new and existing technologies, are integral to imagining what technology will be available, who the stakeholders will be and what their needs will be (ibid.).

Shifting roles and relationships

Participatory Design considers those who will use the new technologies as experts in their work domains, while designers are experts in theirs (Robertson & Simonsen 2012). As the design process changes, so do the different roles of the players within that process (Wright & McCarthy 2010; Redström 2006). The term “user” becomes problematic, as it assumes and limits the relationship between the user and the technology: the technology is a tool and the user uses that tool. In a caricature of the traditional user-centred design process, the researcher observes a passive user and reports his or her findings to the researcher, who generates design concepts based on the findings. Wright and McCarthy (2010) argue that it is much more important to value the whole person’s experience behind the user, to recognise the relationship between what they do and how they feel and give meaning to what they do and what happens to them, which is based on their history or biography (experiences over time) and expectations about future situations. While Participatory Design recognises users as experts of their experience (Sanders & Stappers 2008), this does not negate the critical role that designers play in giving form to the ideas. Likewise, the role of the researcher has also changed, from that of translator of the users’ needs for the designer to that of facilitator. The facilitator allows people to express their creativity at different levels (ibid.).

Participatory Design is also concerned with new relationships. The role of the researcher is not just to gather requirements data from a subject; rather, the relationship between designers and users develops to allow creativity to flow and cooperation to spark (Greenbaum & Kyng 1991). In traditional science and engineering methods and practices, such collaborative creativity is effectively prevented; therefore, Participatory Design has had to develop new

methods and practices to allow these relationships between designer and user to grow.

Process not just outcome

One of the overarching concerns for Participatory Design that distinguish it from other design practices is its concern with process and not just with the designed outcome or artefact. In Participatory Design, there is as much emphasis on

the nature of the design activities, the need for providing means for people to be able to be involved, the need for respect for different voices, the engagement of modes other than the technical or verbal, the concern with improvisation and on-going evaluation through the design process. (Bannon & Ehn 2012, p.41)

Some within the Participatory Design community have called for more detail and articulation of the design processes and how relationships develop and unfold within Participatory Design research (Light 2010; Vines et al. 2013).

Participatory Design is not just about designing an artefact, service or system and therefore not just directed at future users; it is also about designing a *“process that enables different participants to engage in designing the product”* (Robertson & Simonsen 2012). In this way it has much in common with Schön’s articulation of design as “reflection-in-action” (Schön 1983). But while Schön considers the individual designer, in Participatory Design experimentation and reflection are conducted together as social interaction between designers and other participants.

Dialogical perspectives

New methods have been developed within Participatory Design to allow for a more dialogical and collaborative process between designer-researcher and those who will be affected by the design. There has been much written about these methods in the workplace, as well as in the context of designing

consumer products. Well-documented techniques include scenarios, personas, future workshops, cooperative prototyping, storytelling, workshops, games, constructions (e.g., low- and high-tech prototypes, making descriptive artefacts), photos and dramas (Muller 2003; Kensing & Blomberg 1998b; Bødker 2000; Greenbaum & Kyng 1991; Trigg et al. 1991).

Many of these methods use creative forms of engagement to involve “*the whole person in reflecting on and opening up their own understandings of themselves and the taken-for-granted in their situation*”, in order to better understand the richness of their experience (Wright & McCarthy 2010).

Interactive methods have also been developed to overcome the overly abstract representations of users in written reports, in order to help the designer develop an empathic relationship with the user (e.g., personas, scenarios, etc.).

These methods allow for a more dialogical and collaborative process between designer-researcher and those who will be affected by the design than do the more traditional methods for gathering systems requirements of science and engineering. They are not limited to work-based problem-solving projects that aim to improve efficiency and productivity (although they may also contribute these effects). Nor are they limited to the design of consumer products. What these methods have in common is that the role of the designer-researcher has become very much that of facilitator: facilitating a much more direct, active and creative involvement of participants than more traditional software and engineering design methods. Wright and McCarthy (2010) describe the engagement of participants in dialogic design, in which

the designer is not a detached isolated individual who observes but does not affect that which is observed in order to derive in the logical implications of design propositions from the abstract user data. Instead, the designer is involved in dialogue with the participants, each person trying to understand the other's point of view, and their needs and desires, and trying to understand how best to contribute

something to the growing mutual understanding of the current situation and possible futures. The designer and the user are both changing the situation (as a form of inquiry) in order to learn from it and understand how to go on. (Wright & McCarthy 2010, p.69)

More specifically, drawing on a dialogic aesthetics position, DiSalvo (2009) sees the designer as “*the conduit between the participants and cultural discourses and social practices*”. The exchange between designer and participant is what is to be evaluated, rather than the methods or materials produced. “*Aesthetics here relates to an ethical responsibility that is felt towards others, in hearing, valuing and acknowledging that alternative perspectives exist, requiring accountability, flexibility and responsiveness*” (Clarke 2014).

Mutual learning is also part of this dialogical perspective, in which the emphasis of design is on “*establishing, developing and supporting mutual learning between multiple participants in collective ‘reflection-in-action’*” (Robertson & Simonsen 2012). This mutual learning provides an opportunity for exchanges between researchers and the users who will be affected by the designs: the designers gain a greater understanding of the practices involved in the users’ lives, while the users gain an understanding about future technological possibilities through working with the designers (Clarke 2014). In this way, researchers can move beyond taking on the role of “designer” as the expert, and the “user” as defined solely through their use of technology.

Benefits and criticisms

Some of the claimed benefits of participatory and co-designing approaches include rewarding collaborations and innovative design concepts (Iversen & Dindler 2008); better-informed views about technological interventions (Kensing & Blomberg 1998a); the potential for design teams to experiment with various design possibilities using inexpensive materials that are easy to understand and therefore useful at the early design stages (Ehn & Kyng

1992); and greater buy-in of stakeholders in the designed system through a sense of shared ownership (Muller 2003).

Critics have argued that having users directly involved in the design process can be costly, cumbersome, logistically problematic, complex, messy and slow, and that designs developed in protected settings may not be transferable to the real world, and may be disempowering for those who did not take part in the process or are not invested in the results (Kensing & Blomberg 1998a; Bentley et al. 1992; Hughes et al. 1992). Participatory Design has also been criticised for the prevalence of research initiatives faltering after the academic researchers have left the project (Clement & den Besselaar 1993). Participatory Design researchers must work consciously to avoid becoming “*yet another temporary resource taking on the role of the consultant who builds something, leaving behind a system that is difficult to use, fix, and modify*” (Merkel et al. 2004).

Community-based Participatory Design

In the above sections I have described the origins of Participatory Design as well as a number of concerns and perspectives that it brings to the field of computing and systems design. As computing has moved away from the workplace desktop situation and into all aspects of our homes and lives, resulting in the so-called third wave of HCI (Bødker 2006), so, too, is Participatory Design expanding its field of concern beyond the workplace and workers relations, to situations in the home, in the cultural realm, and in community-based organisations. As a result, Participatory Design takes on “*new purposes as well as engaging new participants*” (DiSalvo et al. 2012, p.192). Third-wave examples of Participatory Design include pursuing *aesthetic inquiry* to create engaging experiences for museum visitors (Iversen & Dindler 2008); designing for publics to create services for clients in a homeless women’s shelter (Dantec et al. 2011); participatory sensing to prompt critical engagements and creative expressions between people, technology, and the urban environment (DiSalvo et al. 2008); engaging older

people in discussions about the design of technology; and a platform for sharing those views that are typically marginalised, through artworks and an exhibition (Light et al. 2009).

These examples point to a distinctive new field of Participatory Design research that has emerged recently from the third wave: community-based Participatory Design. DiSalvo sets out this new field of Participatory Design research in the chapter “Communities: Participatory design for, with and by communities” in the *Routledge International Handbook of Participatory Design* (2013). Such studies and practices “*highlight the social constructs and relations of groups in settings that include, but go well beyond, the formal organisational structures commonly foregrounded in more traditional workplace studies*” (DiSalvo et al. 2012, p.182).

DiSalvo believes that community-based Participatory Design

promises to grow in importance in light of the continuing expansion of digital networking in the context of prevailing neo-liberal market globalisation forces and the publics organised against those forces. The on-going trend of lower cost, smaller size, increased capability, tighter interconnection and deeper penetration of information technologies into everyday life presents opportunities to bring Participatory Design perspectives to bear in community contexts.

Community-based Participatory Design does not exclude the workplace, and is not about counterposing workplaces to communities, but, rather, it looks at the “*kinds of relations and interactions that distinguish communities from those associated with formal organisations*” (ibid.).

Types of communities

DiSalvo describes three ways of thinking about communities – in relation to geography or space, or ‘**communities of place**’; to **identity**; and to **interests and practice**. Community in terms of space is where a group of people are defined by a physical spatial boundary, such as a neighbourhood or rural

community. Communities of identity are bound together by unifying classifications (sometimes imposed externally) such as age, ability, ethnic group, sexuality and gender. Often, Participatory Design projects are developed for specific communities of identity such as for the aged (Light et al. 2009) or youth (Björgvinsson et al. 2010). The third type of community relates to groups of people unified by a common interest, and the collective practice around that interest. This could include communities of urban cyclists (Shilton et al. 2008), or urban gardeners (Odom 2010). It is possible for multiple communities to exist simultaneously within a larger community. For example, Akama and Ivanka (2010) describe multiple “*communities of interest*” coexisting within a single “*community of place*”.

DiSalvo identifies two new categories of participant for Participatory Design research that emerge from this new field of community-based Participatory Design. The first is that of community-based organisations, or CBOs; the second is activist and hobbyist communities. CBOs have an organisational structure, but are also often reliant on a volunteer workforce; members are motivated by social justice or community good, rather than profit. Activist and hobbyist communities are usually organised around an issue or interest. They are usually more informally structured than CBOs. An example is Hirsch’s work with Zimbabwean activists (Hirsch 2009). As DiSalvo points out, CBOs and activist and hobbyist communities often overlap in terms of their structures and motivations. They are hybrid, with activist communities often including CBOs, and CBOs including activist or hobbyist communities within them.

The focus of this PhD thesis is a “community of place”, which is a CBO that contains within it multiple hobbyist communities – or “communities of interest” – as well as “communities of identity”. I discuss discourses of community in greater detail in this chapter below.

Creative and cultural endeavours

As Participatory Design highlights a number of new perspectives for systems design research, so, too, does emerging work with communities highlight a number of new purposes for Participatory Design. One of these, as described by DiSalvo (2012), is for creativity and cultural production. This expands Participatory Design in that its methods are now being used for creative expression and critical discovery, whilst also involving learning and political acts. Examples include the work from the Malmö Living Labs, where researchers worked with groups of disenfranchised youth from a community-based hip-hop organisation, to produce ad hoc hip-hop compositions triggered by scanning of barcodes in supermarkets. Through community-based Participatory Design the work engages the mostly (Arab) immigrant youth in cultural production and a form of public expression, contextualised by the pressures from native Swedes to behave in a certain way due to their cultural and ethical background (Björgvinsson et al. 2010). *“This creativity and creative expression, facilitated through community-based Participatory Design, should be considered as a manner of engaging in meaningful public acts related to identity and politics”* (DiSalvo et al. 2012, p.193). Another example is Rachel Clarke’s work on digital portraiture and photo-sharing amongst women from different ethnic backgrounds at a CBO that supported women leaving abusive relationships. Clarke used a long-term workshop approach drawing on participatory photography and feminist arts practice. Through the creative and cultural production of photography, the participants could make *“something concrete that could be taken away, shared in the workshops and at home [which] was important for the women to build confidence, feel a sense of achievement and assert their agency in the process”* (Clarke et al. 2013). Creativity and creative expression as facilitated through the community-based Participatory Design may be a way to focus on social justice agendas and to raise issues of concern for political change.

Both the Democratising Technology (Light et al. 2009) and the

Neighbourhood Networks (DiSalvo et al. 2008) projects involve community-based Participatory Design to create speculative prototypes that are aimed at increasing participants' fluency with new technology and, through creative expression, empower them to participate in critical debates from which they would otherwise be excluded.

The purpose of such community-based Participatory Design projects is to foster and support imaginative ability and the outcomes take the form of dramatic, affective artefacts, systems and events The question for Participatory Design research is less what tools and techniques need to be developed to elicit creativity, but instead: how and towards what ends does creativity as purpose and creative expression as product work within a community context? (DiSalvo et al. 2012)

These projects and cultural concerns of community-based Participatory Design overlap with those of socially engaged arts practices discussed above, in that they aim to problematise technological solutionism, and, through creative and generative workshops and dissemination, aim to create more playful imaginings of the complex social issues and concerns of people's lives. In this way they aim to create alternative spaces and ideas for discussion about the future of technological design.

How community-based Participatory Design differs from traditional Participatory Design

There are a number of distinctions that DiSalvo makes about the concerns, challenges and relationships of community-based Participatory Design (especially those involving CBOs or activist and hobbyist communities) from traditional Participatory Design.

First of all, many community groups are volunteer-based, and members are motivated by rewards other than pay, such as shared interests or desire for social justice. Secondly, the relationships are more fluid. In traditional work-

based Participatory Design, relationships are clearly defined and often form a clear hierarchy of workers and managers. Future users of the system being designed belong to clear strata within that hierarchy. People know each other for long periods of time, and share common schedules and workspaces. This makes it possible for researchers to facilitate workshops, brainstorming sessions and prototyping exercises. In contrast, social relations in communities are characterised by being much more fluid than those found within formal organisational structures. Volunteers may have irregular schedules, members may be temporally remote from each other, and people's commitments to the community may be fleeting. This presents significant challenges for conducting Participatory Design with communities.

An additional challenge that distinguishes community-based Participatory Design from more traditional work-based research is that CBOs and activist and hobbyist organisations are often poorly resourced and have inadequate or outdated technologies. This is due to stretched budgets for technology and a lack of training and personnel with technical expertise (Dantec & Edwards 2008). As Carroll et al. (2008) note, "*They often are trapped by somewhat outdated technologies and information management practices*". On the other hand, as DiSalvo (2012) notes,

such organisations can be especially amenable to participatory approaches....The relative lack of technological sophistication together with shared cultural values, particularly around addressing social needs inclusively, means that more conventional information technology development approaches, relying on cadres of technical staff and formalised, systems-centric methodologies, are less likely to be suitable. At the same time, the relatively greater importance placed on intrinsic rewards and having a direct say in providing services, especially among volunteers, means that members of CBOs are likely to be more familiar with participatory ideals and better able to pursue them actively than in more hierarchical organisations, where the

expectation is more of financial reward for doing what one is told.

(DiSalvo et al. 2012)

Additional challenges that may be more evident in community-based Participatory Design include finding reliable participants. As these communities are often volunteer-based, people may be unable to commit to a series of workshops or put in the time required (Redhead & Brereton 2010). Furthermore, workshops may be culturally inappropriate in engaging participants, and new approaches built on reciprocity and relationship building may need to be considered (Brereton et al. 2014). Redhead and Brereton (2010) explored one alternative to the more traditional Participatory Design approach of developing and refining prototypes in workshops before deploying to the field, by deploying an exploratory prototype in a public place within the community, and then refining it based on observations and feedback by users. This allowed the design to evolve without requiring community members to commit to more formal workshops.

Another challenge for community-based Participatory Design is that projects may engage a number of different communities, each with their own conflicting needs. Decisions and trade-offs must be made between competing values, with the project's underlying goals being explicitly stated and revised throughout (Hirsch 2009).

Furthermore, as DiSalvo (2012) acknowledges, one of the important challenges for Participatory Design work in general and with communities in particular is to not essentialise these communities. Plurality exists in every community, and the danger in seeing communities as homogenous entities is that it silences voices and excludes others. Not all urban cyclists, elderly people or neighbours are the same, or share the same interests or concerns. With these challenges in mind, I now turn to some of the ways that discourses of community from other disciplines such as geography and social work can help inform Participatory Design work and avoid "*imagined*" notions of a community that can mask social diversity (Akama & Ivanka 2010).

Discourses of community

Communities are a central concern for researchers within HCI and computing, however the term “community” remains elusive and little examined (for some notable exceptions see Hirsch 2009; Akama & Ivanka 2010; Etzioni 1999).

While some try to define it, precisely what is meant by the term is seldom reflected on within the technological field. In other fields such as geography, social work or critical theory, the term community is “*complex, contested, fraught with definitional ambiguity and assumption*” (Lynn 2006). Furthermore, community has always been a political notion, but when it is technical or used as a technique for governing, community becomes governmental (ibid.). While in computing and technology fields including HCI researchers often describe community as a discrete, relatively homogenous social category, other fields have moved away from this conceptualisation towards community as a social construct, emphasising the fluid and contested nature of the term.

Silk (1999, p.6), introducing a special issue of *Environment and Planning A*, wrote that community “*suggests any or all of the following: common needs and goals, a sense of the common good, shared lives, culture and views of the world, and collective action*”.

He observed that, originating from one discourse or another, community is always a construction. This understanding is a rejection of understandings of community “*that reproduce a collectivity that is built upon, engenders and fosters a sense of closure, continuity, unity and universalism*” (Devadas & Mummery 2007), such as that described in the work of Benedict Anderson’s *Imagined Communities* (2006). In this classic text, community is understood as collectivity that is enclosed, continuous and unified. But such a reading of community is exclusionary, deceptive, masking of power relations and controlling of difference (Panelli & Welch 2005) because a

community whose fraternity is premised upon a shared and undifferentiated sense of belonging ... is a closing down operation that seeks to silence differences, inconsistencies and contradictions within

the idea of community The foundational violence of the collective, unified community erases differences, contradictions, and forms of being and belonging that do not necessarily align with the constitution of the idea of community. (Devadas & Mummery 2007)

The essentialising formulations of community are potentially dangerous, resulting in the excesses of totalitarianism and myth (Panelli & Welch 2005). In *The Inoperative Community* (1991), the writer Jean Luc Nancy attempts to retrieve the idea of community from being invested in “*the notion of identity and belonging (being-in) to an idea of the community that ceaselessly works to produce more democratic, open and fluid relationships with others to foster a sense of ‘being with’*” (Devadas & Mummery 2007, paraphrasing Nancy 1991). Community is no longer about a static unified and universal identity, as described by Anderson. Rather, it is a network of relations, an active idea, an activity, calling for the “*opening up of other possible and potential networks of relations, of living and being with others*” (Devadas & Mummery 2007). It is about community with difference, that is constantly “*unworked*” and performed (Nancy 1991). As Panelli and Welch (2005) write, “*community is a social construct to be variously and continuously negotiated*”. In short, reading “community with difference” means acknowledging the diversity of people and their relations within community.

In a slightly different approach to community, Lynn (2006) examines discourses of community in terms of the relationship between community and the state. In her analysis she writes,

Community can provide a supportive alternative to the kind of individualism that is a product of economic rationalism ... but its human resources can be exploited by governments in their expectation of it providing self-help and voluntary assistance, and absolving governments of their responsibilities for social infrastructure provision.

She goes on to provide 10 discourses of community, on a scale ranging from the purely economic rationalist approach of “*Devolution of the state/death of*

the social”, in which community is the site for “*delivering minimal health and welfare services, now redefined as economic activity and controlled by the market*” (and where diversity is eliminated physically and culturally), to “*Radical communitarianism*” (based on advanced social democratic ideals) where diversity, with its potential for conflict, serves as the basis for social organisation. Like the dominant discourses of sustainable HCI discussed in Chapter 2 above, Lynn (ibid.) claims that the dominant discourse of community is based on economic rationalism. So researchers and practitioners who understand community as sites of social justice, as spaces freed from market mechanisms, need to recognise that they are in resistance to the ways in which

top-down discourses are effectively reframing communities in their own neo-liberal image The importance of the bottom-up discourses ... are deliberate forms of resistance to the dominant discourse, and they reframe community–state relationships in a way that firmly politicises communities into the public sphere, shifts the political balance and argues for a new form of participatory democracy. (ibid.)

These alternative discourses of community have implications for community-based Participatory Design. First of all, they point out to the need to resist the temptation to frame communities as homogenous stable entities; rather, communities involve a multitude of divergent perspectives and interests. When we work with elderly, people with disabilities, different ethnic groups, etc., we must be careful not to essentialise what ties them together. It means accepting a more fluid understanding of community, as activity and relations between people. This may assist us in working with activist and hobbyist communities who, as Hirsch (2009) points out, are often short-lived, formed for a limited time without formal relationships or organisations. As Hirsch also argues, design is often a trade-off between competing values – working with “communities of difference” means acknowledging and negotiating many

competing values. This becomes further complicated in design work, as we are not just negotiating the needs and values of existing present-day members of a community, but, as design is an inherently future-oriented approach, we also need to consider the needs of imagined future communities (which we may be creating through our designs) (ibid.).

Another implication is that, rather than trying to smooth out the tensions and conflicts that may exist within a community, these areas may be as informative to researchers as identifying consensus (Panelli & Welch 2005). They may also provide a place to “*overcome stagnation and complacency, and generate transition and transformation*” (Secomb 2000, p.137).

Finally, as discussed above, our understanding of community is always political. As Participatory Design is inherently concerned with goals of emancipation, community provides us with an opportunity to examine the relations between community and the state, and whether our research is concerned with social justice and change or we are simply feeding the machinery of economic rationalism. For example, does Participatory Design research with stated sustainability goals work towards more sustainable communities, or is it primarily concerned with economics and making/saving money (through a sustainable consumption discourse as described in the previous chapter)? As Akama and Ivanka (2010) argue,

catalysing behaviour change can only occur when the actors are enacting their self-empowerment. Idealised notions of ‘community’, ‘mechanical’ forms of participation and transmission methods of communication [that replace critical human-to-human engagement] are obstacles in achieving behaviour change that is sustainable and empowering.

Do researchers conducting Participatory Design work with elderly people understand community in terms of improving quality of life whilst acknowledging diversity, or is the work about creating profitable products for an untapped market? And how does the research dance between aiding

community-based resources and devolution of state responsibility for its citizens? If we understand community as being always political, and if we are motivated by goals of social justice and change, then, as Lynn (2006) argues, we need to recognise that we are going against the dominant discourse of community, which is economic rationalist, and that resistance should be part of the strategy. These are all points that I have tried to keep in mind whilst undertaking this research at Spitalfields City Farm.

Conclusion

As I have discussed in this chapter, the problem of sustainability within HCI is typically framed in terms of individual behaviour change, based on discourses around economic rationalisation and sustainable consumption. Critics argue that focusing on behaviour change to be more in line with what researchers deem to be “green” limits the design space, has limited efficacy due to its failure to address complex social, cultural and political issues, and marginalises alternative voices from the debate. The literature suggests ways to expand the design space of sustainable HCI by changing the focus from individuals to groups, involving users in the design process, and designing for reflection rather than for prescriptive solutions.

Another suggestion to expand the design space of sustainable HCI is to situate research within the context of food, and in particular small-scale and urban agricultural communities, because such sites present opportunities to examine the critical interrelations between social, environmental, economic, political and personal factors that impact on sustainability and therefore suggest ways to overcome the overly simplistic framings of sustainability within behaviour change approaches. I have presented an overview of this growing field of research within HCI that studies small-scale grassroots urban agricultural communities.

While food-growing communities provide the context for my research, in this chapter I have also introduced non-utilitarian perspectives within HCI to provoke reflection on work-based assumptions that designers may unconsciously be bringing into computing as it permeates all aspects of our lives. By valuing reflection, ambiguity and multiple interpretations over clear narratives of use, approaches such as ludic design suggest ways to expand the dominant narratives of sustainable consumption within sustainable HCI.

I concluded the chapter with a discussion of the ways in which users have been involved in the design process, to see how we can begin to incorporate more diverse voices in the debate about sustainability, and to address concerns that sustainable HCI relies on top-down, expert-led solutions that lack relevance in users' lives. Participatory Design has traditionally been used to include those who will be affected by computing systems in the design process, allow marginal voices to be heard, and increase stakeholder buy-in. Community-based Participatory Design has more recently concerned itself with the challenges of working with community-based organisations and with their informal work structures, and the opportunities for creativity and cultural production to raise awareness on matters of social concern. Drawing on fields outside HCI, I highlighted how an active notion of community allows for alternative discourse from that typically found in HCI, i.e., communities are not made up of homogenous, static entities, but, rather, can be understood as active notions that incorporate difference, and are always in relation to the state.

I pick up on these concerns and opportunities in the next chapter (Chapter 3), where I describe my rationale and ways of applying these approaches.

Chapter 3 – Methodology

Introduction

In the previous chapter I outlined the dominant narrative of sustainable HCI, which views the problem of sustainability in terms of sustainable consumption. This discourse necessitates expert-led technological solutions to increase efficiency and productivity and support individual behaviour change. I highlighted a number of criticisms of the dominant narrative of sustainable consumption starting to emerge within the field, and voices from within sustainable HCI that seek to broaden the design space beyond persuasive sustainability (Brynjarsdóttir et al. 2012). As elaborated on in detail previously in Chapter 2, the main problem with this framing of sustainability is that: i) it doesn't work (Abrahamse et al. 2005; Snow 2013) because it doesn't take into account the complex social, cultural, political and economic realities of people's situated lives (Brynjarsdóttir et al. 2012; Strengers 2008), and that, therefore, ii) it alienates its target audience (Hobson 2002), iii) its success is premised upon competition rather than cooperation (Dourish 2010), iv) it foists responsibility for the environment onto individuals rather than states and corporations (Hobson 2002), and iv) it fails to incorporate diverse voices into the discussion about what sustainability means and how this should impact the design space.

In Chapter 1 I outlined two goals for this PhD research:

- 1) To expand the design space of sustainable HCI beyond the dominant narratives of efficiency and productivity, and
- 2) To include non-“expert”-led voices into the discussion about what sustainability means, and how such understandings can influence the design space.

The Literature Review (Chapter 2) highlights two possible ways to expand the design space of sustainable HCI and to begin to address these goals. Ludic design (Gaver 2002) uses reflection and ambiguity to allow for personal meaning-making and appropriation, and for non-utilitarian discourses of sustainability to enter the design space, while Participatory Design has been used as a way to include more voices in the debate of what sustainability means, and to include those who will be affected by the design in the design process. In this way it provides opportunities for designs to be meaningful and relevant for the user and thereby helps overcome the alienation of much persuasive sustainability (Hobson 2002; Brynjarsdóttir et al. 2012; Strengers 2008).

The place/context in which I do this work of expanding the design space is **small-scale agricultural communities**. Such sites may allow us to broaden our understandings of sustainability beyond individual behaviour change, and to study the complex interrelations between social, economic, and environmental factors that impact on sustainability (Odom 2010; Hirsch 2014). In addition, they answer the call within HCI to move the focus from consumption to production (DiSalvo et al. 2010), from individual to collective action, citizenship and community (Baumer & Silberman 2011; Hirsch et al. 2010), and from competition to cooperation (Dourish 2010).

With these goals and design philosophies in mind, I have approached the research with the following question:

How can the design space of sustainable HCI be expanded through a community-based Participatory Design methodology with a ludic focus, in the context of an urban agricultural community?

This question raises the following additional questions when conducting the research at Spitalfields City Farm:

- How can ludic encounters be designed to support the farm and potentially others with similar values?

- What understandings of sustainability does this approach elicit, and how do they differ from the sustainable consumption paradigm?
- What are the challenges and opportunities of community-based Participatory Design when working with diverse and non-settled communities such as the farm?
- What methods are culturally sensitive and appropriate to inclusive engagement of the community?

This chapter explains my methodology, which is rooted in community-based Participatory Design and is underpinned by the non-utilitarian, open and playful values of ludic design. Community-based Participatory Design and ludic design are not often brought together. While there are some notable exceptions in the form of community-based Participatory Design that have a playful, open and non-utilitarian focus (see, for example, Brynjarsdóttir et al. 2012; Light et al. 2009; DiSalvo et al. 2008), they are not framed as examples of ludic design. Focusing on ludic encounters through a community-based Participatory Design methodology has allowed me to conduct the research within the reality of the messy context of the farm. As I explain in greater detail below, I have been influenced by ludic design but am not subscribing wholesale to the approach. I am basing my methodology on community-based Participatory Design, but have looked for ways to overcome its traditional utilitarian focus. In order to overcome these limitations, I've taken from both. In particular, I focus on aspects of community-based Participatory Design that allow for community building, education and cultural production (DiSalvo et al. 2012). In addition, my methodology incorporates perspectives from socially engaged arts practice.

I begin this chapter by presenting research through design, of which both ludic design and community-based Participatory Design are examples. I then present a recap of ludic design and why I have chosen to draw on this approach, as well as a discussion of its limits and affordances. I follow this with a discussion of community-based Participatory Design, why I have

chosen this as my main methodology, and its limits and affordances. I explain my research design, which consists of three case studies. I end this chapter with an overview of my methods for data analysis.

Research through design

Design practice and research is becoming increasingly integrated within HCI, often through *research through design* (Gaver 2012; Zimmerman et al. 2007). Research through design usually takes the form of design artefacts and an account of processes that resulted in the creation of those artefacts, where the goal is the communication of new knowledge (Frayling 1993). Both ludic design and Participatory Design research are examples of research through design in that they are both concerned with producing new communicable knowledge through the designed artefacts/and their accompanying reports.

Research through design typically involves

some form of user-centered design, where researchers involve potential users of the system at some stage in the design process; through sketching, narratives or design proposals, they explore a wide space for potential designs; craft and detail is of value; and most importantly, the process of making is essential to discovery. (Gaver 2012)

The research is generative: it is concerned with future situations and future users, with “*creating what might be*” (Gaver 2012) and on making the “*right thing*” (Zimmerman et al. 2007). “*The artefact reflects a specific framing of the problem, and situates itself in a constellation of other research artefacts that take on similar framings or use radically different framings to address the same problem*” (Gaver 2012). The objects, or artefacts, produced in both ludic design and Participatory Design research embody the implicit theories that the designers drew on, which range from

the philosophical (what values should designs serve?) to the functional (how should those values be achieved in interaction) to the social (what will the people who use this be like?) to the aesthetic (what form and appearance is appropriate for the context?). Moreover, artefacts do not address these issues analytically, but represent the designer's best judgment about how to address the particular configuration of issues in question. (ibid.)

The final outcome of research through design is a framing of the problem, an articulation of the preferred state and a series of artefacts (models, prototypes, products and documentation) of the design process. The artefacts are the “*concrete embodiments of theory and technical opportunities*”. It is these objects that help transfer the research ideas and findings (ibid.).

I present the studies described in Chapters 5 and 6 as research through design, producing new knowledge that can be communicated through the designed artefacts and their accompanying reports.

Ludic design overview

In the previous chapter I discussed ludic design (Gaver 2002) as an approach to technology design that tries to disrupt their reduction to singular narratives of efficiency and productivity. Ludic design and other related design philosophies stemming from the third wave of HCI (such as *reflective design* (Sengers et al. 2005), *slow technology* (Hallnäs & Redström 2001; Odom, Banks, Durrant et al. 2012), *critical design* (Dunne & Raby 2001; Dunne & Raby 2013) and *experience-centred design* (Wright & McCarthy 2010) are characterised by a move away from work situations, and, with computing becoming a part of our everyday lives, a new emphasis on culture through aesthetics, emotion, intimacy, experience and pleasure (Bødker 2006; Bardzell & Bardzell 2011). Rather than eliminating *ambiguity* (Gaver et al. 2003) and *multiple interpretations* (Sengers & Gaver 2006) from design, as

would be done within traditional efficiency and task-based situations, within ludic design these values are seen as a resource to HCI research and development as it seeks to undermine these dominant narratives of efficiency and productivity. Ludic design draws on methods from art and design, and calls for innovative, creative approaches to the design and conception of digital systems that signal a move away from more traditional science and engineering methods.

Why I chose this and not other approaches

My research takes inspiration from ludic design as a way to broaden the design space of sustainable HCI beyond the dominant narratives of efficiency and utility. The rationale for having a ludic focus for the design within a context of sustainability is that, by providing opportunities for appropriation over consumption, pleasurable experiences over efficiency, and ambiguity rather than clear narratives of use, the designs may allow for open-ended reflection and personal meaning-making and therefore will have more relevance to those that use them (Brynjarsdóttir et al. 2012). In this way, ludic designs can begin to address the alienation and lack of relevance to users of traditional individual behaviour change designs within sustainable HCI (Strengers 2008; Hobson 2002).

I have also chosen a ludic approach as it aligns with my epistemological position. Unlike with traditional science and engineering approaches, in which the researcher is an objective observer who does not influence the research, ludic design takes a dialogical stance, where the research is a process that unfolds over time and is influenced by relationships, perspectives and experiences that all parties involved in the research (including the researcher) bring to the study. While I have been influenced by the other non-utilitarian perspectives described that stem from the third wave, such as critical design (Dunne & Raby 2001), reflective design (Sengers et al. 2005) and slow technology (Hallnäs & Redström 2001), I have chosen to frame and evaluate the research through design case studies as ludic because ludic design

incorporates the reflective and the slow, and also because it makes explicit its non-utilitarian objectives. I have chosen to draw on ludic design over other approaches that have a non-utilitarian focus, such as designing for fun (Monk & Frohlich 1999); designing for joy (Glass 1997); designing for pleasure (Jordan 2002); and playful user experience in digital games (Korhonen et al. 2009), because these are often described within the context of user interfaces or product design and because the ludic approach fits better with my worldview and with my experiences as an artist-designer.

How what I've done is different from Gaver's ludic design

The ludic designs developed as part of Gaver's Interaction Research Studio at Goldsmiths, University of London, such as the Indoor Weather Stations (Gaver et al. 2013), the History Tablecloth (Gaver et al. 2006) and the Drift Table (Gaver et al. 2004), are all designs for the home. They are designed to disrupt the dominant narratives of utility as applied to our domestic activities such as cooking or adjusting the heating. They seek to challenge the ways that our values are represented through domestic technology design (Gaver et al. 2004; Gaver et al. 2013). My approach extends and builds on recent developments within ludic design (Gaver et al. 2015) that take it out of domestic spaces and into a more public, communal and outside space.

Another difference is that the ludic designs from the Goldsmiths studio are all finished, robust artefacts with high production values and with visual appearance and material finish that much thought has gone into. In contrast, the design artefacts produced during this PhD research (e.g., the Talking Plants and the Bug Hotel described in Chapters 5 and 6 respectively) have a much more rustic and unfinished visual aesthetic that is fitting with the wild and unruly aesthetics of the farm. Rather than creating new objects, these designs have leveraged existing and familiar objects such as a watering can and a bug hotel. Furthermore, the Talking Plants and the Bug Hotel are bespoke designs intended for, and designed with, a specific community in mind, while recent ludic designs that engage communities, such as the

Energy Babble described in Gaver et al. (2015), are batch-produced and the same design is deployed to different communities. In these ways I have taken the principles of ludic design and applied them to different contexts, with different aesthetics and material finishes.

Limits of ludic approaches

One challenge to a ludic approach that values multiple interpretations, provocation and ambiguity is how to evaluate it (Sengers et al. 2005; Sengers & Gaver 2006): if we can no longer evaluate in terms of criteria generated from one authoritative interpretation, then we are in danger of declaring every design that elicits multiple interpretations a success. Sengers et al. (2005) argue that designers cannot abdicate responsibility for the success of such systems.

With some notable exceptions (DiSalvo et al. 2008; Wallace & Wright 2011; Clarke et al. 2013; Light et al. 2009; Wright & McCarthy 2010), third wave open-ended approaches to HCI do not place great importance on including users in the design process. For example, ludic designs such as the Indoor Weather Stations (Gaver et al. 2013) involved those who would be living with the designs in their homes for a number of months only once the systems were complete and ready for deployment. As my research is interested in including non-‘expert’-led voices into the design process, I also draw on the methodology of community-based Participatory Design.

Community-based Participatory Design overview

Participatory Design presents a set of theories, methods and studies that have historically been used as a way to include more voices in the design process and to involve those who will be affected by the design in the decision-making process. Community-based Participatory Design (DiSalvo et al. 2012) focuses on the relations of informal organisations and groups, rather

than on the workplace as in traditional Participatory Design. It has been used to include marginal voices, empower communities, include users in the design process, and focus on creativity and cultural production, which are all relevant to expanding the design space of sustainable HCI, particularly within the third wave.

I have chosen to base my research methodology primarily on community-based Participatory Design for the following reasons: It offers a way to involve those who will be affected by the design of technological systems to be included in the design process, thereby creating designs that will have relevance and meaning for those who will be affected by them, and addressing the problem of authoritarian and top-down expert-led solutions being irrelevant to the intended users (Brynjarsdóttir et al. 2012). It provides a way to shift the focus within sustainable HCI away from individual behaviour change to larger groups. It provides a means to include diverse and often underrepresented voices in the design process, thereby expanding our understanding of what sustainability means beyond the dominant discourse of sustainable consumption (Hobson 2002). Community-based Participatory Design has also recently been concerned with cultural production rather than increasing productivity and efficiency.

By choosing community-based Participatory Design as a methodology within the context of sustainability research, not only am I acknowledging a commitment to addressing the matter of concern about the environment, but I am also committing to improving the lives of the community with which I am working. My position as a designer/researcher is not neutral. I aim to share control with the users, and base the research on values of inclusion and enhancement of people's lives rather than reduction of inefficiencies, improvements to productivity, or service to brand identity. As I show in my findings of the exploratory study (Chapter 4), this methodology is also appropriate within the context of the farm as its ethos is explicitly inclusive and participatory.

Epistemological positions of Participatory Design are similar to those of open-ended approaches, and align with my own position, in that researchers are not objective observers of a research subject who do not influence the design. Rather, dialogical encounters between designer and participants help build meaningful reciprocal relationships in such a way that the more traditional designer-as-expert cannot. It emphasises mutual learning and exchange between partners. In my research I draw inspiration from Participatory Design methods as a way to develop these dialogic relationships, and to learn about people's past and present experiences to inform potential future ones. However, while I remain committed to the goals and motivations of Participatory Design, I also recognise that as a designer I am not just a facilitator, but, rather, that I bring my own ways of seeing, my values, sensibilities and interests to the design process, and that this is often in tension with others', and may sometimes conflict with a commitment to "*genuine participation*" (Robertson & Simonsen 2012). I discuss these tensions in greater detail in the chapters that follow.

Why this and not other approaches that involve the user in the design process?

The agenda of Participatory Design differs from other traditions within HCI of involving users in the design process. For example, **user-centred design** has most often involved users in order to use them for mass commercial product development, rather than improving people's lives (Wright & McCarthy 2010). **Action research** (Reason & Bradbury 2001; Hayes 2011) developed from the social sciences and focuses on the shared knowledge and learning produced through design research, which involves cycles of reflection and action that is fed back into localised changes. Users are included at each step of the way including deciding on a research question, defining the problem space, and evaluation. It privileges collaborative learning rather than a design product or outcome. Evolving out of Participatory Design, user-centred design and John Dewey's pragmatist philosophy, **experience-centred design** (Wright &

McCarthy 2008; Wallace & Wright 2011; Wright & McCarthy 2010) is about improving the lives of users. It focuses on the lived and felt experiences of users, the interplay between sensation, emotion, intellect, and action in time and place. It grew out of user-centred design, which began to focus on the experiences – such as fun, enchantment, beauty and pleasure – of people living with technological products and not just using them. It takes a dialogical approach that emphasises the relationships between people and design as co-production. **Socially engaged arts** perspectives have also been used within HCI to address complex social problems such as sustainability (DiSalvo et al. 2009), climate change (Jacobs et al. 2013), aging populations (Light et al. 2009) and multicultural and healthcare settings (Clarke et al. 2013), whilst also concentrating on the everyday experiences of people's lives. Like Participatory Design, socially engaged arts perspectives highlight an intentionality where practitioners work with communities for social change. DiSalvo argues (2009) that socially engaged arts provide a way for a more critically aware sustainable HCI.

In this research I have drawn on the experiences and skills I gained whilst working as a socially engaged artist with different communities, including street children, rubbish recyclers in Cairo, disadvantaged youth, the visually impaired, and Romany Gypsies in the East Midlands. These projects introduced participants to new technologies such as digital audio, video, and photography, and editing software. Cultural production through digital technology use and dissemination in the public realm through exhibitions, installations and events became a way to engage with issues of concern, raise awareness and empower participants (Clarke et al. 2013). This echoes recent concerns of cultural production and expression within community-based Participatory Design (DiSalvo et al. 2008; Björgvinsson et al. 2010; Light et al. 2009; Clarke et al. 2013). My experience and skills from practising as a socially engaged artist have helped inform this research.

Limits and affordances of community-based Participatory Design

One of the overarching concerns of Participatory Design that distinguish it from other design practices is its concern with process and not just the designed outcome or artefact (Robertson & Simonsen 2012). In Participatory Design, there is as much emphasis on

the nature of the design activities, the need for providing means for people to be able to be involved, the need for respect for different voices, the engagement of modes other than the technical or verbal, the concern with improvisation and on-going evaluation through the design process. (Bannon & Ehn 2012)

Some within the Participatory Design community have called for more detail and articulation of the design processes and how relationships develop and unfold within Participatory Design research (Light 2010; Vines et al. 2013). In this thesis I have attempted to answer these calls by providing in-depth reflections on the process of involving people in the design research within this particular context.

Critics have argued that having users directly involved in the design process can be costly, cumbersome, logistically problematic, complex, messy and slow, and that designs developed in protected settings may not be transferable to the real world and may be disempowering for those who did not take part in the process or are not invested in the results (Greenbaum & Loi 2012; Kensing & Blomberg 1998a; Bentley et al. 1992; Hughes et al. 1992). Such problems are magnified within community-based Participatory Design projects where social relations are characterised by being much more fluid than those found within formal organisational structures. Volunteers may have irregular schedules, members may be temporally remote from each other, and people's commitments to the community may be fleeting. However, as DiSalvo (2012) notes, informal organisations can be especially responsive to the methods and ideals of participatory approaches.

A note on terminology

Throughout this thesis I use different terms for the people who took part in this research. I acknowledge the problematic nature of the term “user” (Wright & McCarthy 2010), particularly in multifaceted participatory work (Vines et al. 2013). I have tried to remain consistent in my use of the following terms:

Staff: People who are employed by the farm.

Volunteers: People who work at the farm but do not get paid a regular salary. This includes corporate volunteers, regular and irregular volunteers, and Vodafone volunteers (volunteers who are sponsored by the company Vodafone to work on a project for 3–6 months and are paid around £2000).

Visitors: People who come to the farm, either to take part in public events, or simply to enjoy the space. They do not take part in any work-based activities.

Participants: People who helped to develop the research through providing feedback, generating ideas, or taking part in workshops.

Users: People who interacted with the Talking Plants (Chapter 5) or the Bug Hotel (Chapter 6).

Members of the community: This refers to staff, volunteers and visitors. The way it is used in this thesis implies an active notion of community that is not based on identity or interest; rather, it includes anyone who takes part in activities at the farm. Such a usage highlights the problematics of doing design work with communities, when the community is non-settled and people come and go with no commitment to return.

Research design

This research is conducted through three case studies undertaken at Spitalfields City Farm over three years. I have chosen to locate my research

within a single “community of place” (rather than spreading my research over a number of sites and with different communities) as a way to tailor a number of design outcomes for one community, and with the aim of producing clear threads running through them. Another reason for choosing long-term research with a single community was to allow for the designs to build on each other. More importantly, it was a way to allow the increasingly reciprocal relationships between myself and members of the community (Brereton et al. 2014) to grow and flourish over time, rather than cutting them short and starting again, as I would have had to had I moved on to a different community. Ideas were allowed to evolve gradually without the need to build something quickly, test it and leave (ibid.). As I explain in greater detail in each of the case study chapters below, key participants accompanied me on this co-journey: Mhairi, the manager, was instrumental in giving the go-ahead for the overall research, and for each of the studies, by providing me with space, recruiting volunteers and staff, and offering support and encouragement. Olivia, the growing coordinator, and Mandy, the volunteer coordinator, were key participants in the Talking Plants study. Esther, the education coordinator, was my collaborator on the Bug Hotel project – she was instrumental in initiating the project and was involved in all steps along the way. Other participants who were part of this journey over the three years include Richard and Lutfun, both growing coordinators, and Tess, a long-term volunteer. In the following chapters I quote extensively from interviews and meetings with these key participants, to highlight how they have been an integral part of this process.

Study 1 – Chapter 4	Study 2 – Chapter 5	Study 3 – Chapter 6
	<i>First research through design case study</i>	<i>Second research through design case study</i>
Exploratory study	Talking Plants study	Bug Hotel study

Table 1: Case studies

I now come to a short overview of the research design of the three studies, which are presented in greater detail in Chapters 4, 5 and 6.

The aim of the exploratory study (Chapter 4) was to get to know the farm community, and to understand its values, needs and challenges. It was also to build relationships and get to know the different individuals, social dynamics and subcommunities at the farm. It had the additional aim of introducing the farm to my way of working, and establishing mutual trust and respect.

The study lasted five months (February–July 2012) and consisted of participant observations, interviews, and a series of creative workshops that drew on community-based Participatory Design, participatory mapping, ludic design and my previous experiences as a socially engaged arts practitioner. The workshops generated design concepts, but, rather than working these up into prototypes with the community as a traditional Participatory Design approach would require, they were used as a dialogical approach to get to know the community and for inspiration, not information, for the future designs. I conducted a thematic analysis (Braun & Clarke 2006) on the data, which included interview transcripts, participants' drawings and maps, and my field notes.

The findings of the exploratory study were then used to inform two subsequent research through design case studies drawing on principles and concerns of community-based Participatory Design with a ludic focus within a

context of sustainable HCI (see Table 1). These designs were co-produced with members from the farm community to reflect and support the values, practices and challenges that were elicited from the exploratory study.

The first research through design case study is the *Talking Plants* (Chapter 5), a ludic encounter with edible plants that encourages food growing and supports the educational aims of the farm. The project involved an iterative process of design, build, and evaluation with the community. It was developed with key participants: Mandy, the volunteer coordinator, and Olivia, the growing coordinator. It was evaluated at three public demonstrations at the farm, where I conducted semi-formal interviews with, and made detailed observations of, users of the system. At the final evaluation I also collected questionnaires and recorded video footage of users interacting with the Talking Plants. The data were analysed through a thematic analysis, and presented as a set of findings about the designed artefact and the participatory process of making it.

The second research through design case study is the *Bug Hotel* (Chapter 6), an interactive sound sculpture aimed at supporting rest, reflection, education and play, and to provide a habitat for beneficial insects and pollinators. The project was developed with the key relationship with Esther, the education coordinator at the farm. An artist was commissioned to design and build the physical structure of the Bug Hotel, and over 100 volunteers also contributed their labour. Other members of the community were involved through a consultation event that was aimed at eliciting ideas and concerns about use. The project was evaluated through interviews with Esther, meetings, the consultation event and observations of users interacting with the Bug Hotel. A thematic analysis was applied to the data collected and presented as findings on the designed artefact and the process of involving the community in the Participatory Design methodology.

In Chapter 7 I examine the case studies alongside each other, which allows for common themes and threads to be drawn out that can illuminate the overall contribution. I present a set of strategies and challenges for conducting research for ludic encounters through a community-based Participatory Design methodology in the context of sustainable HCI.

Data analysis – thematic analysis

In each of the three studies, thematic analysis (Braun & Clarke 2006) was used to analyse the data set, which included interviews, field notes, and printed materials produced in the workshops and other public events. This method of data analysis was chosen as it is flexible and accessible, and provides an established and structured method for making sense of large and varied data sets, such as interview transcripts, field notes, drawings and maps. It was also chosen for its theoretical freedom and for its potential to provide rich, detailed and complex accounts of data. This makes it suitable for use within a community-based Participatory Design methodology, which produces rich and varied data. Thematic analysis provides a balance between rigour, accessibility and flexibility: it is not as time-consuming as other methods such as grounded theory or conversational analysis, and therefore it allows the researcher to spend more time engaging with the community, which is essential to community-based Participatory Design.

Braun and Clarke (2006) stress that researchers take an active role in identifying patterns in the data, selecting those which are of interest and reporting them to the user. They must apply their knowledge, intuition and expertise in analysing the data, rather than attempting to suspend their informed judgments. Researchers are not passive channels and themes and codes do not “emerge” from the data. Thematic analysis provided the means to analyse in depth the data from each of the three studies, but also helped to identify similar patterns across all three data sets.

Thematic analysis is similar to other, more established qualitative analysis methods that seek to identify patterns of meaning in data, such as grounded theory or conversational analysis. However, grounded theory creates theory from the data, and requires theoretical commitments and knowledge of approaches that thematic analysis does not. Thematic analysis is not bound to any theoretical framework, thereby making it more accessible than grounded theory.

In this thesis I followed the thematic analysis methodology as presented by Braun and Clarke (2006) which includes six iterative phases for coding the data, grouping codes into themes, and generating a report.

What constitutes a theme?

In thematic analysis, a theme captures something important about the data in relation to the research question. It represents a pattern of meaning or response in the data set. There are no hard rules about what constitutes a theme, or how many instances of that theme should appear in the data in order to justify it being a theme – researchers must use their own judgment. The process of identifying themes involves “*careful reading and rereading of the data*” (Rice et al. 1999).

How to do thematic analysis?

Doing thematic analysis is a recursive process that involves moving back and forth between the data set, the coded extracts of data being analysed and the analysis of the data being produced. Writing takes place throughout the entire process.

There are six phases of the analysis. The first phase involves familiarisation with the data by transcribing them, reading them, and writing down initial ideas. The second phase involves generating initial codes by coding for interesting features and collating data for each of these initial codes. These codes can depend on the data (making them “data-driven”) or they can be

approached with specific questions in mind (making them “theory-driven”). The third phase involves searching for themes by collating codes into potential themes and gathering all data for each potential theme. There are two ways of identifying themes: 1) a bottom-up or inductive way where themes are dependent on the data and not driven by the researcher’s interests and 2) a top-down, deductive or theoretical way, where themes are driven by researcher’s theoretical or analytical interests. The fourth phase involves reviewing the themes by checking if each theme works in relation to the coded extracts and the whole data set. In this phase a thematic map of the analysis is generated. The fifth phase involves defining and naming the themes by analysing to refine the specifics of each theme and the overall story of the analysis. In this phase, clear definitions and names for each theme are generated. The themes are not just a paraphrasing of the data – rather, the essence of the data associated with each theme is identified, stating what is interesting about them and why. The sixth and final phase involves producing the final report of the analysis by selecting compelling examples from the data set for each theme, conducting a final analysis on those examples and relating the analysis back to the research questions as well as the literature. The analytic narrative goes beyond description; it makes an argument in relation to the research questions.

Limits and affordances

The advantages of thematic analysis are that it offers a good balance between flexibility and accessibility on the one hand, and rigour on the other hand. The method is accessible to researchers and the results are accessible to readers. It is a useful method when conducting participatory research and can highlight similarities and difference across a data set (Braun & Clarke 2006).

The main criticism against thematic analysis is that “anything goes”: that there are no clear guidelines or agreement on how to do it. Insufficient detail is often provided by researchers about the steps taken and the decisions made in

conducting the analysis. They don't make their assumptions about the what, why and how of the analysis clear, often stating that the analysis "emerged" from the data rather than acknowledging the active role of interpretation. Additionally, because it is not a "branded" approach, unlike grounded theory or conversational analysis, it also lacks the reputation of being an established method for qualitative data analysis.

In order to address these criticisms, I have tried to provide in detail the what, how and why of the analysis, which is an essential part of conducting a successful thematic analysis.

How I conducted the thematic analysis

In each of the three data sets I applied a deductive thematic analysis (Braun & Clarke 2006) to the data set, following the six phases of analysis as described above. The first step of the analysis involved familiarising myself with the data set by reading through it numerous times and noting down initial thoughts and potential codes. I then began systematically going through the data and generating codes, which I manually wrote down in the margins of the text. Data items may have a single code, many codes, or none at all.

The deductive, or theoretical, approach to the data means that the codes are generated by examining the data with specific questions or interests in mind.

In the first exploratory study (Chapter 4) I applied an analysis to a data set, which included interview transcripts, field notes, and written notes and drawings produced in the workshops. The deductive or theoretical analysis was conducted with the intention of gaining insight into the main values, challenges and needs of the farm, conceptualisations of sustainability and community, and current and potential future uses of technology. I also looked for insights into the challenges and opportunities of the community-based Participatory Design methodology.

In the second study (Talking Plants – Chapter 5) I applied a deductive analysis to a data set, which included interview and discussion transcripts,

field notes and observational data. Questionnaires and video footage were used as supplemental data. In the third study (Bug Hotel – Chapter 6) I applied a deductive or theoretical analysis to a data set, which included interview and discussion transcripts, field notes, written notes and drawings from participants, and observations of interactions.

The analyses of both the research through design case studies (Chapters 5 and 6) were performed with the intention of understanding how users interacted with the systems, how they reflected on them and the meanings they made from them. I was also interested in understanding how they related to sustainability, how they provided for ludic encounters, and how they supported the values, needs and challenges of the farm as identified in the exploratory study. In addition, I approached the data with an eye to understanding what worked and didn't work about the community-based Participatory Design methodology, including tensions and challenges that arose.

The next stage of the analysis involved sorting the different codes into potential themes and sub-themes by analysing the codes and how they fitted together. I organised the themes and sub-themes into a map. This was followed by an iterative process of going backwards and forwards between the data, the codes and the map, reviewing the codes and the map, and adjusting the map by changing the grouping, and deleting and adding themes and sub-themes until I felt satisfied that the themes adequately captured the contours of the coded data and that it accurately reflected the meanings evident in the data set as a whole (Braun & Clarke 2006).

The results of the thematic analysis for each chapter (Chapters 4, 5 and 6) are presented in the findings sections of those chapters and presented under the thematic headings and subheadings as organised by the thematic maps generated through the analysis.

Although in each of the analyses of the three case studies I was approaching the data with specific themes, questions and interests in mind, the data also

presented me with examples of codes that I found interesting that I was not specifically looking for (as one would with an inductive analysis).

I acknowledge the active role I brought to this process, making choices according to my research interests and my experiences as an artist-designer, and grouping them in a way that made sense to me.

Summary

In this chapter I have provided an overview of my research methodology, which is underpinned by community-based Participatory Design with a ludic focus. Drawing on ludic design provides a way to open up new perspectives on sustainability beyond the dominant narratives of efficiency and productivity, while Participatory Design provides a set of commitments and methods to involve users in the design process and make sure those designs are relevant. I have highlighted how both perspectives align with my epistemological position as well as my experiences as a community-based artist/designer. In this chapter I also explained my rationale for conducting the research over three years with a single community, as it allowed me to build on reciprocal relationships and for ideas to evolve gradually and progressively. I have chosen a thematic analysis to analyse the data produced in the three studies, as it balances accessibility and rigour in the analysis of rich, diverse materials.

Chapter 4 – Exploratory study

Introduction

In the previous chapter I outlined my research methodology, discussing how community-based Participatory Design with a ludic focus allowed me to conduct the research within the messy context of the farm. I argued that the ludic focus presented opportunities to move beyond efficiency narratives that were typical of sustainable HCI, while Participatory Design with communities highlighted creativity and cultural production with a commitment to improving the lives of users and including them in the design process.

In this chapter I present the first of three case studies at Spitalfields City Farm. The field study serves as a foundation for the chapters that follow, in taking forward the discussion in Chapter 2 of expanding the design space of sustainable HCI through a community-based Participatory Design methodology.

The aim of this exploratory study was to get to know the farm community and for them to get to know me. It was also to critically understand the values, needs and practices of the farm in order to see how these could inform future research through design case studies at the farm within the context of sustainable HCI research.

In particular, I have tried to understand: What methods are appropriate for designers to employ when engaging urban grassroots food-growing communities? What are the values, needs and practices of this community and potentially others with similar urban experiences? What are the implications and opportunities for designing interactive systems to reflect and support these values? What can sustainable HCI researchers learn from grassroots, participatory cultures of urban gardening communities?

The structure of this chapter is as follows: I first provide a contextual overview of the farm. I then describe the methods chosen and a detailed description of how I employed them in the study. I then present the findings from a thematic analysis (Braun & Clarke 2006) of the data produced in the study, which includes a report on the values, needs and practices of the farm, current and potential future uses for technology to support these, and a reflection on the tensions arising from the community-based Participatory Design methodology of the study. I conclude with a set of implications and opportunities for designing with technology to benefit the farm, which were used to inform the subsequent research through design case studies (Chapters 5 and 6).

In this chapter I attempt to describe in detail the structure, process and outcomes of the study in order to contribute a rich description of the community-based Participatory Design. This answers the call within the research community to provide more detail and articulation of the design processes and how relationships develop and unfold within Participatory Design research over time (Light 2010; Vines et al. 2013).

Contextual overview

Like many community gardens in the UK, Spitalfields City Farm was started in the 1970s by a group of local people who occupied wasteland to grow fresh food. It is now a registered charity with a changing task force that at the time of conducting this study included nine paid members of staff (only the manager is full-time). Most of the day-to-day work with animals and gardens is performed by volunteers, some of whom have been coming for years, while others come once and never again. The site is open every day of the week except Monday, from 10.30am till 4.30pm. The land is owned by the London borough of Tower Hamlets and Network Rail (the company responsible for railway infrastructure in the UK).



Figure 5: Overview of part of the central area of the farm

The different gardening areas include a wildlife garden, a plant nursery, three polytunnels, large outdoor growing areas, an inside area for propagators, and raised beds. During this study the farm was in the process of converting some adjacent land gained from Network Rail into a large community food-growing area called Spiralfields Gardens. In the various food-growing areas food is grown year-round in rotation, with seeds being planted to replace the crops that will soon be finished. There are different community gardens for volunteers who want to grow food from different geographical regions, including African, Bangladeshi and Somali crops.



Figure 6: Bangladeshi Kodu growing inside a polytunnel

The gardens are not allotments, nor individual plots; rather, they are tended by groups of volunteers: people come, work the land, and take home some fresh vegetables when they have finished. Some of the produce is also sold very cheaply to the public who visit the farm, as are plants and other products of the farm. There are also many educational activities such as workshops, tours, school group visits and more, as it is not only a farm where food is grown but also one where people come to learn about food, sustainability and animal husbandry. I discuss these activities in greater detail in the “Findings” section below. The farmyard is the name given to the area where most of the animals live, and is home to a number of farm animals such as sheep, goats, ducks, chickens (some of which have been rescued from factory farms), cows, pigs and donkeys. There are a number of indoor structures including an office, small meeting room, education room and staff kitchen.

Staff members have different roles and areas of responsibility that sometimes overlap. There is an education coordinator, farmyard (animal husbandry) coordinator, volunteer coordinators, and growing coordinators. Staff come from different backgrounds including community work, ethnobotany,

veterinary science and social work. They are predominantly female, white British and in their thirties or forties.

The farm is located in the inner-London borough of Tower Hamlets, which is one of the most deprived economically in the UK. It has been characterised by high population density, large-scale immigration, ethnic diversity, poverty and huge divides between rich and poor. Traditionally white working class, it has a history of supporting immigrants from around the world since the 17th century. The borough now has large Bangladeshi and Somali communities. There are high levels of racial segregation in the borough with around 50% of secondary schools being entirely non-white. It has the highest number of school pupils in England whose first language is not English (74%),⁵ and the highest rate of child poverty in England at 57%.⁶ At the same time, Tower Hamlets also contains Canary Wharf, one of London's two main financial centres and home to some of the world's largest banks. It has proportionally more people earning above £90,000 than the London average (Household Income in Tower Hamlets report 2013⁷).

According to the National Health Service's (NHS) Quality and Outcomes Framework for 2011/2012, adults in Tower Hamlets are more likely to have diabetes than those in the rest of London and England.⁸

⁵ <http://www.naldic.org.uk/research-and-information/eal-statistics/eal-pupils> (accessed 13th August 2015).

⁶ <http://endchildpoverty.org.uk/files/child-poverty-map-of-the-uk-part-one.pdf> (accessed 13th August 2015).

⁷ <http://www.towerhamlets.gov.uk/idoc.ashx?docid=b1e38174-452f-4488-b02f-1bd81d3bbbe2&version=1> (accessed 13th August 2015).

⁸ <http://www.qof.ic.nhs.uk> (accessed 13th August 2015).

Methods: participant observation and workshops

In February 2012 I began the fieldwork that contributed towards this study. The fieldwork was conducted over five months (February–June 2012).

Drawing on Participatory Design and my previous experiences as a socially engaged artist, I developed a mixed-method approach, epistemologically suitable to areas of complex societal and cultural concern, such as sustainability (Hirsch et al. 2010). This involved: i) participant observation work and interviews, and ii) creative workshops.

Participant observation stage

In order to form relationships with the staff and volunteers, to get a sense of the workings of the farm, and to begin to understand the concerns and needs of the farm environment, I began the fieldwork with a stage of participant observation. My position as a researcher was made clear in all interactions.

Once a week for six weeks I joined in drop-in volunteer gardening sessions, which are open to all every Wednesday from 11am to 2pm. After an initial signing-in and induction session that included a tour of the farm and basic health and safety procedures, I started working on various gardening tasks. Over the six weeks I performed the following tasks: planting herb seeds in pots of compost, transplanting seedlings to bigger pots, watering, fertilising plants with liquid harvested from the wormery, putting seed trays into electric propagators, harvesting herbs and vegetables, weeding, planting potatoes, mixing animal manure with soil, mulching, taking cuttings from perennial plants and clearing beds for new crops. These are the regular tasks that are required to keep the farm produce growing in rotation according to the seasons and available land. I worked with different vegetables at varying stages of growth, including spinach and chard, potatoes and radishes, many different kinds of herbs, and various vegetables that are popular with the local

Bangladeshi communities such as Kudu, Naga chillies, mooli radishes and mustard greens. The jobs were pleasurable and relaxing.

These sessions offered me an opportunity to get to know the staff and volunteers and have many and varied conversations about growing food and the community. I sometimes worked in isolation, but more often with other volunteers or with one or other of the staff. We usually took a break for tea or ate lunch together at one of the outside picnic tables. Sometimes someone would make a fire to sit around, and twice there was a cooked meal to partake of. Staff and volunteers at the drop-in sessions I attended were a diverse mix of people, ranging in age from early twenties to late sixties, and nationalities represented included Japanese, Caribbean, North American, Spanish, Bangladeshi, Turkish, Scottish and English. The weather varied from warm and sunny in March to cold and rainy in April, but the weather did not seem to affect the numbers of volunteers.

I also attended a number of other events such as campfire talks (a series of evening talks around topics such as sustainable architecture and bread baking), a composting session (to support people wishing to gain advice on how to compost their own food waste) and a Sunday “eco-chic” market. The latter, which launched in March 2012, was a market with food, clothing and bric-a-brac stalls, aimed at generating income for the farm and drawing in new crowds, particularly from the very popular nearby Brick Lane Sunday Market.

Alongside these sessions, I conducted five formal interviews and 15 informal interviews with members of the community including the manager, growing coordinators, and regular and irregular gardening volunteers. The formal interviews were semi-structured and ranged from 15 to 45 minutes long. They focused on the general running of the farm, understandings of community, motivations for participation, current challenges, and the uses and non-uses of technology. These were audio-recorded and transcribed. The informal interviews followed a more open-ended format and varied greatly in length. I recruited interview participants by directly asking them, and also by snowball

sampling, in which one interviewee suggested someone else of interest. Many of the informal interviews were conducted with people I was working alongside at the drop-in volunteer gardening sessions.

I took detailed field notes on all interactions and observations, which I subsequently wrote up in a blog that included further reflections, and I audio-recorded the formal interviews. This stage of the study produced handwritten field notes, audio recordings of interviews, and photographs that I took of activities and places at the farm.



Figure 7: The author engaging in participant observation

I discuss the outcomes from this stage of the study in the “Findings” section below.

Workshop stage

The second phase of the study consisted of five workshops adapted from existing Participatory Design and participatory action research methods, as well as based on my own socially engaged art practice. The workshops lasted

1.5 hours each and were held on consecutive Wednesday afternoons, after the drop-in volunteer gardening sessions.

I chose the workshop method as a way to

- encourage participants to reflect on their taken-for-granted situation (Wright & McCarthy 2010) and defamiliarise the everyday (Bell & Sengers 2005)
- explore community members' potential future experiences with new designs, based on dreams, fears and aspirations (Visser et al. 2005; Müllert et al. 1987)
- draw on the knowledge of local people and enable participants to create visual representations of social problems, questions and opportunities
- provide rich social encounters between participants and facilitators.

Participants were recruited to the workshop through printed flyers, which were left in the office, and handed out to staff and volunteers on the day of the workshop. Information also went up on the farm website and the Facebook page. I also spoke personally to people I met at the farm and invited them to join in.



Figure 8: Flyer invitation to participate in workshops

I decided to position the workshops as an art project as I wanted to draw on my experiences and skills as a socially engaged artist and also build on the previous successes of the Talking Quilt project at the farm, which I described in the Introduction chapter (Chapter 1). Workshops were drop-in, meaning that participants did not have to commit to staying to the end of a workshop or to attend any number of workshops. Staff suggested that this drop-in format was most likely to succeed. Each workshop had a different maximum number of people, ranging from two to ten. Numbers also fluctuated within individual workshops. Ages ranged from early thirties to sixties. Some volunteers were new to the farm; others had been coming for years. Some workshops took place in the open central spaces of the farm, or, when raining, in a meeting room, or under a marquee-like shelter. The workshops explored themes such as everyday objects and tools; different spaces on the farm; personal stories and emotional responses to the farm; the farm in relation to the city;

technological use; and current challenges and possible solutions. I adapted and was inspired by existing workshop methods such as context mapping (Visser et al. 2005), participatory mapping (Chambers 2006), Future Workshopping (Müllert et al. 1987) and Cultural Probes (Gaver et al. 1999).

The workshops generated rich materials including maps, drawings, handwritten responses, photographs taken by participants (for example, of their favourite places on the farm), and my own photographs documenting the workshops and materials produced, and detailed field notes which I wrote up and reflected on in my research blog. I decided not to audio- or video-record the workshop sessions as I felt that it would be too intrusive and technically complicated.

I will now describe the structure of each workshop in some detail, including the activities, who was present, and some of the outcomes. The main outcomes are not discussed here; rather, they are discussed in the “Findings” section below.

Workshop 1: Question your teaspoons!

The focus of the first workshop was to explore everyday objects on the farm. On the top of the piece of paper I wrote a quotation from the French author George Perec: “*Question your teaspoons!*” (Perec 1997). The idea was to encourage defamiliarisation as a way to creatively explore relationships, needs and values on the farm as well as new possibilities for the role that technology could play in supporting these. As Bell et al. (2005) write, about defamiliarisation, “*It is by questioning the assumptions inherent in the design of everyday objects that HCI has always opened up design spaces, pointing towards better and more innovative designs*”.

After drop-in volunteer gardening on Wednesday afternoon I set up shop in a visibly accessible space, at the main picnic tables outside the office – the heart of the farm. On the largest table I spread out paper and drawing

materials as well as a number of everyday objects I'd collected including a watering can, pot, cup and teaspoon.

People dropped in and out of the session. The workshop started out with four participants, including one staff member and three regular volunteers. Over the course of the session three people dropped out and two others joined in. It began raining so we moved inside the meeting room for the conclusion.

I began by introducing myself and the project to participants, and explained the aim of the session. Participants were asked to walk around the farm and bring back an everyday object, or, if they couldn't bring it back, to photograph it and describe it.

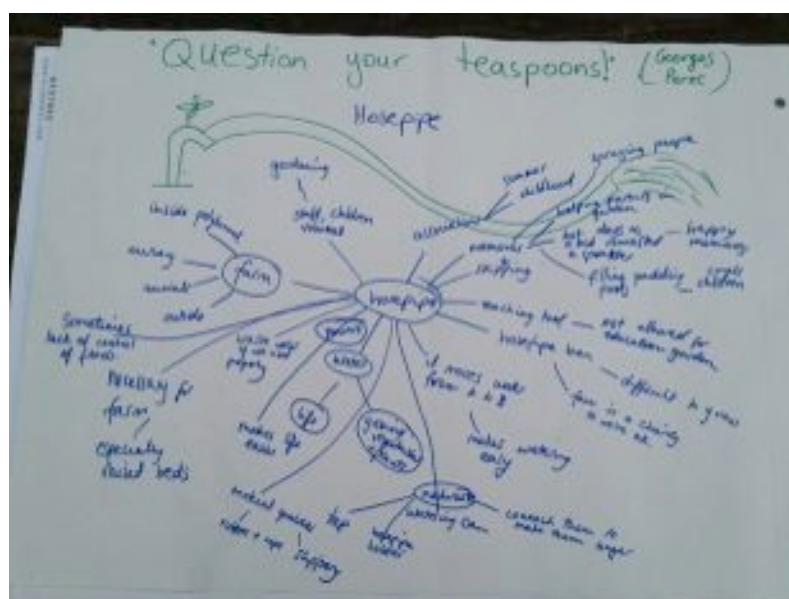


Figure 9: Questioning the hosepipe object on the farm

Three objects were chosen: a hosepipe, an empty plastic seedling pot, and a wormery. Each object in turn was drawn on a piece of A3 paper, and participants were asked to describe its qualities and properties including

where it lives; its function; who uses it and why; its values and meanings; its relation to other objects; its material qualities; and any associations, memories or stories connected with the object.

The next stage was to imagine “What if these objects could move, think, feel, talk and be connected to other objects?”

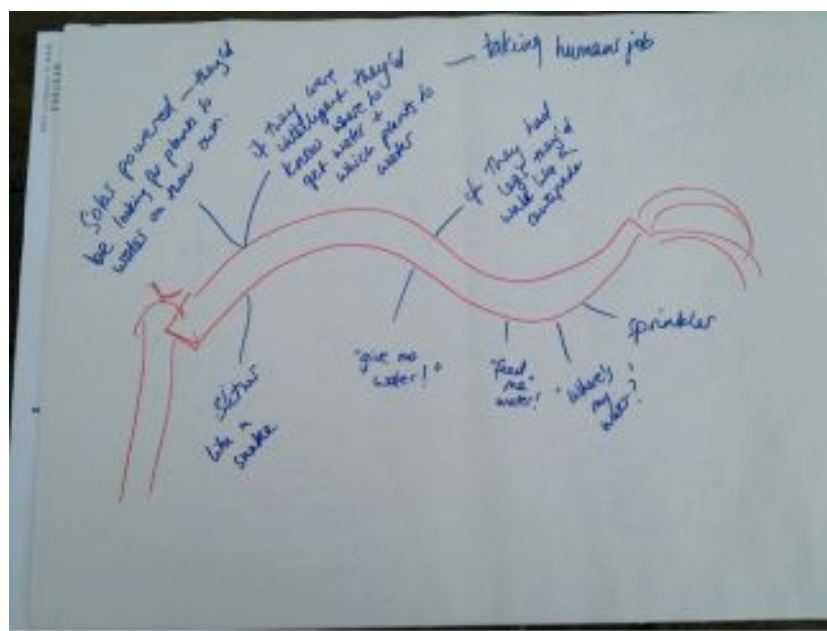


Figure 10: The solar-powered hosepipe

I drew and described the results on the piece of paper (see Figures 10 and 11). The solar-powered hosepipe knows where to find water, and which plants need water. It slithers like a snake to find plants that need water.



Figure 11: The humble pot

The humble pot has a mothering, nurturing attitude to the potted plant inside. It feels responsible, especially for the baby plants. It embraces them. It feels comfortable and fulfilled. It moves to the compost heap to fill itself up with soil. It moves into the sun and out of the sun when it needs to. If it could talk to another object it would talk to the hosepipe. Together they would make humans redundant. They would run the farm.

Workshop 2: Collaborative mapping of the farm

The second workshop involved collaboratively mapping the space, trying to capture people's stories, associations, conflicting histories and desires for the space, as well as the different names used for different spaces.

This workshop was inspired by the tradition of participatory mapping, from participatory action research (Chambers 2006), as well as by a technique of Collaborative Mental Mapping, as developed for the Tokyo DIY Gardening Workshop (Berthelsen 2011).

I placed an A1-sized piece of paper on a table in the meeting room, empty except for a large circle in the middle, with the words "Your Farm", and a

depiction of the grass road that leads up to the centre of the farm. Participants were asked to fill in a small form on paper, printed with the words “Title; What; Where; When; Who”. They were asked to choose a place on the farm and to describe it, giving it a name, and to add personal associations, stories, and feelings about it. Then they were asked to draw the place where they thought it was located on the map, add any visual details or words, and connect the form with string to that place.



Figure 12: Overview of map

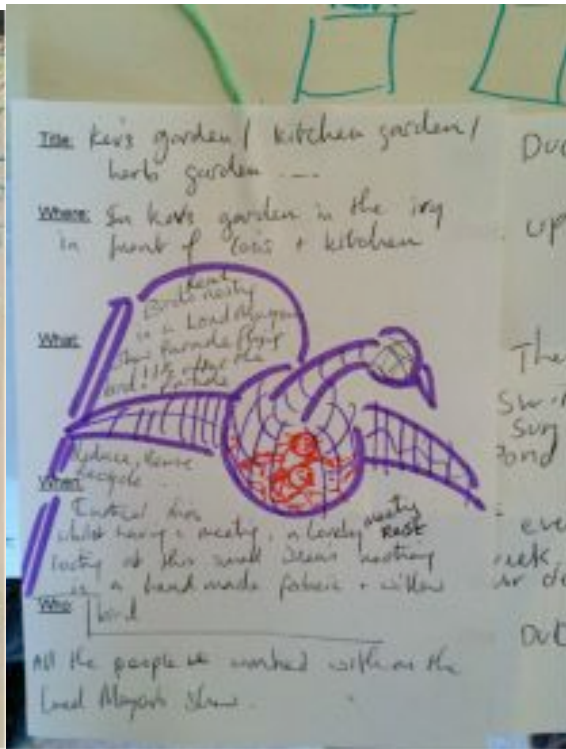


Figure 13: Detail of map

Figure 14: Detail of filled-in form

There were seven participants, including four staff and three volunteers.

The workshop started very low-key, with a couple of volunteers reluctantly performing the request to contribute their version of the farm on the map. But, as people slowly got involved, most notably four members of staff, it became very lively and involved.

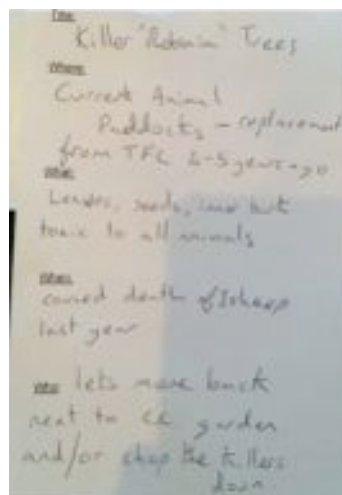


Figure 15: Example of participant's chosen place on the farm

Workshop 3: More collaborative mapping

The third workshop involved more collaborative mapping. This time I was interested in focusing on two things: firstly, the relationship between the farm and the city, and, secondly, mapping a future ideal farm. The latter was an attempt to access people's desires for the farm and in this way to gain a deeper level of concerns and problems as well as aspirations and needs of the farm's users.

This workshop drew inspiration from Participatory Design methods such as generative mapping, and in particular collaging toolkits (Visser et al. 2005). I brought to the workshop a collection of images culled from newspapers and magazines according to the guidelines that Visser recommends, such as choosing diverse image content from different contexts, including images of people from diverse backgrounds, and a balance between positive and negative images, and I tried to include images of an ambiguous nature. I also drew on Future Workshops (Müllert et al. 1987) in asking participants to map their ideal farm, and the Cultural Probes (Gaver et al. 1999) in asking participants to map a place they like and dislike.

After the success of the previous workshop, more staff members joined in. There were 10 participants, including six staff, three volunteers and one visitor.

Due to heavy rainfall we held the workshop in the meeting room.

Site: Spitalfields City Farm
Where: Pig paddock
What: I love the crab apple trees which change with the seasons. I also love that the pigs can sleep concealed in their sty, only to emerge when enticed with food and surprise new visitors.
When: I love the paddock best on a warm spring day when the crab apple blossom is in bloom and the children have come to visit.
Who: Visitors, school children, the pigs, volunteers - everyone.

Figure 16: Example of place chosen on the farm



Figure 17: Participants gathering around to fill in the farm-map



Figure 18: Final outcome



Figure 19: Detail

Workshop 4: The use of technology

The focus of this workshop was current and potential future uses of technology to support the farm. The workshop was divided into three sections. In the initial stage we explored existing technology use. We started by making two lists of all the technology in people's lives, and at the farm. I didn't specify what I meant by "technology". The middle section explored existing problems, needs and concerns. I then asked people to write on sticky notes a single word to describe something they are concerned about, or see as a problem or want to change or need on the farm. The final section of the workshop explored a future where all possible technology was available. How could we use this technology to address these problems and needs? These last two stages draw on the technique of Future Workshops (Müllert et al. 1987), as well as Iversen and Dindler's (2008) concepts of *anchoring* and *transcending* in Participatory Design.

It was, once again, raining heavily, but this week there was a large marquee set up with a picnic table underneath, so that's where I laid out my wares and invited people to come and have a cup of tea, take a break from work and join in the workshop. There were five volunteers and three staff, but a number of people came and went, and by the end of the workshop only one volunteer and one staff member remained.

Workshop 5: Discussion about themes and design ideas

The focus of the fifth and last workshop was to feed back to the community about initial design concepts. It was not very satisfactory in terms of participants and data generated. Unfortunately, a staff meeting had been scheduled at the same time, and there were not many volunteers at the farm that day. Only two participants came to the workshop. The workshop took the form of a discussion about some of the initial design concepts that were emerging from the study, and initial thoughts I had for technical possibilities.

However, the conversation was not very fruitful. Although this response may indicate that I had saturated the community with the workshop format, I don't think this was the case. Rather, the unsatisfactory nature of the workshop was due to the low number of participants, the social dynamics between the participants and myself, and my failure to structure the workshop in an adequately engaging and evocative manner.

Data analysis

The fieldwork produced rich and varied data that formed the data set for a thematic analysis (Braun & Clarke 2006). These data included

- transcripts of audio-recorded interviews
- my field notes and observations, as written up in my research blog
- maps, drawings, and handwritten responses and photographs generated by participants in the workshops
- photographs I took during the field study documenting the workshops and the activities at the farm.

They also include an interview that was conducted at a later stage (in 2013, once the exploratory study had ended). However, I only use data extracts from this interview to add depth to the findings, rather than adding something new. I conducted this additional interview with Richard, a staff member, because he was the volunteer coordinator for a large new community garden at the farm that was only established after the exploratory study had concluded.

I applied a deductive thematic analysis (Braun & Clarke 2006) to the data set, coding the textual and visual materials into initial codes. See Chapter 3 for a detailed discussion on thematic analysis, including my rationale for choosing this method of analysis. The way that I applied a thematic analysis is the

same for all three case studies described in this chapter and in Chapters 5 and 6, and the method is described in more detail in Chapter 3.

A deductive or theoretical approach to data involves generating codes by examining the data with specific questions or interests in mind. The specific questions and interests I had in mind when examining these data come from the specific aims of the study as described in the “Methods” section of this chapter:

- What were the values, needs and practices of the farm?
- How did the farm conceptualise sustainability?
- How did the farm conceptualise community?
- What were the current and potential future uses of technology at the farm?
- What worked and didn’t work about the community-based Participatory Design methodology and what issues and challenges did this approach bring to the study?

Although I conducted a deductive process of coding the data, I also coded parts of the data for things that I was not looking for if they seemed interesting, surprising or potentially relevant.

I acknowledge the active role I brought to this process, making choices according to my research interests and my experiences as a socially engaged artist, and grouping them in a way that made sense to me.

The results of the thematic analysis are presented in the “Findings” section below, and presented under the thematic headings and subheadings as organised by the thematic map generated through the analysis.

Findings

In the following sections I present a discussion of my findings as organised by the thematic analysis I conducted. The analysis is organised into themes and

sub-themes. I chose these themes because they were most related to the specific questions that I was looking for in the data (detailed in the previous section on data analysis), and how they could inform future design case studies at the farm. Due to space limitations I could not include them all, and therefore chose to focus on the themes that I felt were the most relevant or interesting to a technological intervention at the farm, and to broadening an understanding of sustainability for HCI research through community-based Participatory Design. Many of the themes are interconnected and overlap.

I organise the analysis into the following themes and sub-themes:

Community	<i>Inclusion</i> <i>Diversity</i> <i>Participation</i>
Sustainability	<i>Conceptualisations of environmental sustainability</i> <i>Resilience</i> <i>Gift exchange</i> <i>Care</i>
Education	
Well-being	<i>Growing and eating healthy food</i> <i>Recovery</i> <i>Relaxation</i>
Technology use	<i>Attitudes to augmentation of gardening practices</i> <i>Mobile and communications technology</i>
Methodological tensions	<i>The need to plan vs the need for flexibility</i> <i>Open-ended vs requirements gathering</i> <i>Tension between roles and relationships</i>

Table 2: Themes and sub-themes of thematic analysis

The majority of the quotes below come from transcripts from formal semi-structured interviews with three staff and two volunteers. Other material comes from the workshops, informal interviews and field notes. Where the data come from sources other than the interview transcripts I make an explicit note of this.

Community

Community is seen as a core value, as summed up by the farm manager's words: "*I always see the farm as a giant community centre*" (Mhairi). In the farm context community can be defined by *inclusiveness, diversity and participation* – these are things that are valued explicitly and that the farm strives for. It tries to structure its activities to encourage that definition of community.

Inclusion

The farm's a great place to come to because when you're working with animals and plants they're not particularly judgmental and I think that really helps people's confidence. (Mhairi)

The farm strives to be an inclusive environment, welcoming and accessible to all. Entrance is free and people can wander in, around, and out as they wish. The farm reaches out to and tries to engage people from different cultural and socio-economic groups, including the local Bangladeshi, Zimbabwean and Somali communities, for example through its Coriander Club gardening sessions for Bangladeshi women, a Somali men's gardening session, and gardening days for growing vegetables from Zimbabwe. It also offers opportunities for people at risk of social exclusion, such as those suffering from mental and physical ill health as well as addictions, depression and homelessness, and refugees, children with disabilities, and ex-servicemen with post-traumatic stress syndrome. At the same time there are corporate volunteers, who come, often in large groups, from corporate companies for a

day of community service, and work alongside the other volunteers at the farm.

The inclusiveness results from the warm and inviting welcome, pleasant surroundings, and frequent opportunities for eating a meal together that is cooked on site. Care and attention is taken to make the farm look attractive (e.g., see Figures 20 and 21), and there are many signs and labels dotted around the farm to help people get their bearings and find information.

Interviewees reflected on the inclusive atmosphere of the farm, as they described their first visit:

It felt very inclusive, very welcoming. And so from there on out it, OK this seems like the right place to volunteer. Because they automatically treat you like family. ... And I had free curry my first day ... you can't beat that. (Mandy)

We walked in here ... and immediately were struck by the beauty of the place in the summer and also the warmth of welcome, and there was a woman who was a volunteer here who took out half an hour to show us around and it just was a really engaging and exciting place to be.

(Richard)

Community at the farm is constituted by its ability to include all.



Figure 20: Daffodils in a pot on a picnic table



Figure 21: Sign at the farm

Diversity

Community is not constituted at the farm as a unified identity, continuous, enclosed and living in harmony (Anderson 2006), as is often the case in the HCI literature on communities (Akama & Ivanka 2010; DiSalvo et al. 2012). While community is recognised as a core value, it is conceptualised at the farm as an active notion (Agamben 1993; Nancy 1991; Devadas & Mummery 2007) in which many different types of people come together in a shared time and place. Community here is about shared activity and relations between people of difference.

It's about the space here, about the space anywhere that you use, and about the people that are working in that space and how they make other people feel. (Mhairi)

As discussed above, the community is diverse in terms of age, ethnic groups, dis/abilities, language, and socio-economic backgrounds. Also as discussed above, there are specific gardening activities for subcommunities of interest and identity (DiSalvo et al. 2012) including a Zimbabwean women's group who tend a plot where they grow vegetables from Zimbabwe; Bangladeshi women's and men's gardening sessions; gardening sessions for a men's

health group; a Turkish psychotherapy group; a young farmers' garden. The farm also caters for ex-servicemen suffering from post-traumatic stress disorder, for homeless people, for people with disabilities, and for people suffering from addictions. I attended a series of "Sowing New Seeds" workshops run at the farm that focused on growing crops not normally grown in the UK, and drew in participants from Zimbabwe, Bangladesh, Ghana, Caribbean/West Indies, Pakistan, Sri Lanka, Turkey and Western Europe.



Figure 22: Sewing New Seeds workshop participants

Cultural diversity is evident in the plants that are grown from around the world, as well as the stories that connect people to their cultural communities through food. For example, the Naga chilli – the most fiery of all chillies – is notoriously difficult to grow in the English climate, and therefore is one of the most prized plants that are grown and sold on the farm. Each year Lutfun receives a box of between 20 and 50 plants from a farmer in the UK who donates them to her. She lovingly takes care of them, together with her army of volunteers, and once they are big and strong she sells them for up to £15 a plant. These chillies are so valuable that Lutfun reported that they must be

kept literally under lock and key, or there is a real risk of someone stealing them.

Diversity is conceptualised as a positive aspect of community at the farm, where there is space to include everyone, as illustrated in the following quotes:

We've got the trendies of Spitalfields and Brick Lane ... and the large Bangla and Somali community, and the farm's a big melting pot for the two of them to come together. And everybody's on an even keel.

(Mhairi)

I met so many different people that had a different outlook, a different perspective. (Tess)

Gardening can be a really gorgeous solo activity but it can be a really gorgeous group activity that you end up just having all sorts of marvellous conversations with people you wouldn't respect whilst you're working together on the plot on the land. (Richard)

I love hearing all the different accents and sounds. (Mhairi)

Here, community is the opportunity to put aside differences and be together with people you wouldn't normally talk to, as you take part in a shared activity in space and time. This echoes Nancy's concept of an active community as discussed in the Methodology chapter (Chapter 3).

This is a way of having a face-to-face experience of what really Muslims are like and what Bangladeshi people are like. You can't do much better than interacting with positive people from cultures that you don't know anything about, or you've only heard bad things about, to kind of change your mind. (Mandy)

The face-to-face interaction with diverse people promotes tolerance of difference. But it could also expose tensions, as the farm consists of different communities, each with vested interests that are sometimes in conflict; there

is competition for resources such as land, money and labour, which result in colonisation and incursions into urban space. For example, there is a clear divide in the physical layout of the farm between the animal farmyard and the gardens. Staff and volunteers are also divided into those who tend the animals and those who tend the gardens. The manager (Mhairi) alluded to conflicting loyalties when she said:

One thing that's difficult on a site this size and on a community centre, is that if you get gardeners could be prone to just thinking about the gardens and not the animals' needs, and the animal workers will be thinking, well the animals can walk all over the gardens ... so you get some conflict.

This was echoed by Mandy, one of the volunteers, who was working on improving communications between the farmyard and the gardeners: *“for a long time, I guess there's been this divide between the gardens and the farmyard, so a lot of communication would get lost, and things weren't working as smoothly as possible”*.

This tension was also evident in the workshops. For example, in the first mapping workshop staff and volunteers contested the lines and boundaries of the different sections of the farm, exposing their differing investments, loyalties and divisions.

The implications here for community-based Participatory Design, as highlighted by DiSalvo (2012), are that such communities must not be essentialised. Plurality exists in every community, and the danger in seeing communities as homogenous entities is that it silences voices and excludes others (Devadas & Mummery 2007). The farm demonstrates an understanding of *“community with difference”* (Nancy 1991), which means acknowledging the diversity of people and their relations within community.

Rather than trying to smooth out the tensions and conflicts that may exist within a community, these areas may be as informative to researchers as

identifying consensus (Panelli & Welch 2005). They may also provide a place to “*overcome stagnation and complacency, and generate transition and transformation*” (Secomb 2000, p.137). By rejecting a totalising idea of community, we can see the farm as a dynamic place that brings people together in shared activity. In this way, the value placed on inclusivity supports its aim of increasing capacity, which in turn has the potential for scaling up its impact on the wider community and on the environment.

Participation

Participation is key to the notion of an active community at the farm (Nancy 1991). People are welcome to start creative projects and use the space for all kinds of initiatives. For example, during our field study one volunteer began to organise the “eco-chic” Sunday market, where local vendors could sell upcycled clothes and jewelry. Mhairi explained, “*I think that’s what’s really important about community spaces, that community can feel that they can come and ask and get involved and start projects*”. Volunteers are able to take over management of some of the gardening areas. For example, during the participant observation stage of the exploratory study, I worked alongside a volunteer who was cultivating a herb garden on a small section of the farm. She was setting up the herb garden and a tea hut for mums and toddlers to get involved as a way to get out of the house and away from the usual Sure Start centres.

Volunteers can participate in all areas of the farm, including gardening, cooking, farmyard, general maintenance work, education and play activities. We observed opportunities for visitors to take part in sewing and knitting workshops, recycling activities, composting advice sessions, and workshops on growing exotic vegetables.

Even the workshops that I ran were viewed as a way to participate in creative activity at the farm, an opportunity to engage socially together in a shared time and place, as described by one participant: “*this [workshop] group*

connects people even more. We can have a tea and a chat together" (field notes of talking with volunteer).

Participation in eating, drinking, talking and resting together was also seen as a valued way of constructing community. In one of the workshops participants identified the need for a community meeting room. This could be a place where people could have a break from working, sit down together, make a cup of tea or have lunch and socialise, even when the weather is bad. It would also be a place where people could get to know each other and hear about all the different projects going on at the farm. Mhairi commented that a community building would increase the activities that the community could participate in by enabling *"us to operate basically 24/7 and in the wintertime to be able to offer a lot more courses than we can offer at the moment"* (Mhairi).

Sustainability

Sustainability is a core value and practice at the farm. As Richard explained, *"sustainability as regarding environmentalism is absolutely at the heart of the project. And sustainability in so far as meaning that the project goes forward is at the heart of it as well"*. Mandy also explained that *"the major goals of the farm [are] to be a bit more sustainable and cohesive and try to provide education to everybody and include everyone"*.

In this section I discuss ways that sustainability is conceptualised, as well as the idea of resilience, gift exchange and care, and how these contribute to a holistic understanding of sustainability.

Conceptualisation of environmental sustainability

By introducing food production into the city, the farm's conceptualisation of sustainability attempts to shift our dominant cultural narratives around food production and consumption in which food growing is separated from everyday urban activities. Rather than understanding sustainability through a lens of sustainable consumption (Hobson 2002) as is typical in HCI,

environmental sustainability at the farm is considered holistically. This is evident through the cycles of production, consumption and waste. Animal waste (manure and bedding straw) is composted and either used on the vegetable beds or offered for sale to visitors. Cooked food scraps are fed to worms in the wormery, which in turn produce a rich plant fertiliser. Weeds such as chickweed and dandelions supplement the animal feed, as does supermarket waste, which is donated and delivered to the farm. Waste materials are incorporated into buildings and structures, and the farm itself was, like many urban community gardens, built on disused land. A recently developed wildlife area has been designed along permaculture⁹ principles and makes best use of the available land, labour and growing conditions.

The reduction of food miles by production of fresh seasonal food on site is a conscious contribution to sustainability that the farm attempts to make, as indicated by the low-carbon lunch offered for free to all (see Figure 23).

⁹ Permaculture is a branch of environmental and ecological design based on natural ecosystems. See <http://www.permaculture.org.uk> (accessed 8th October 2013).



Figure 23: Low-carbon lunch

The manual labour that gets performed, either through working the land to produce food, tending the animals, maintaining the site or cooking – as well as the varied opportunities to learn new craft and upcycling skills – contribute to an alternative conceptualisation of sustainability to that offered through the discourses of sustainable consumption:

I think that if we regard consumerism as something that exists and something that's not beneficial then one of the greatest cures for consumerism is re-engaging people with craft activities, with activities that involve manual dexterity and being in the zone. Consumerism is a function of people who aren't in the zone and who are agitated and tired and bored rather than people who are relaxed and engaged and energised. (Richard)

Sustainability here relates to maintaining the social, environmental, and economic benefits of being engaged in gardening (and other craft) activities. Environmental sustainability is not privileged over, or separate from, the social. As much emphasis is put on the social benefits of gardening together, and the well-being it contributes to individuals, communities and the earth (discussed in more detail below). As Feenstra (1997) writes in her article on local food systems and sustainable communities, *“the way food is grown, distributed and eaten also profoundly affects the environmental, social, spiritual and economic wellbeing of the community”*.

Resilience

Resilience refers to a system’s robustness and buffering capacity to changing conditions. It has become a key term in sustainability discourses (Berkes & Folke 1998). Rather than aiming for environmental equilibrium, it is argued, we should try to build our systems stronger so that they can adapt to environmental, social and economic upheavals. Such an approach is evident at the farm. In 2005 it lost over half its land and gained new land when the East London train line cut through the farm. It has had to move gardens around. The manager described the farm’s resilience: *“We’re quite proactive and we respond to change quite quickly”* (Mhairi).

Speaking of the new Spiralfields community garden at the farm, Richard explained that resilience to a changing climate was designed into the layout and choice of plants:

A lot of the garden is [designed as] a forest garden which will be using perennials and trees to produce food which will be showing a lot more resilience to periods of draught, periods of cold, periods of monsoon ... the whole thing has been designed totally to be completely off-grid because we don't know what's going to happen with the prices of water, prices of energy, or the availability of water and energy.

(Richard)

Resilience also connects to the idea of capacity building, which involves skilling local people off-site in their own communities. For example, the farm provided a professional gardener to help set up a community garden at a local housing estate. Another example was a group of Bangladeshi women who came to the farm to learn how to make mobile planters that they could take away and grow vegetables in at a local respite centre for carers for disabled children. They learnt skills such as handling power tools and sawing wood.



Figure 24: Vegetable planters constructed and decorated by Bangladeshi women at the farm

Capacity building also means having the farm as a resource that people can come to in order to get what they need to start growing. The farm tries to make

communities stronger and [give] communities what they want within their immediate surroundings It's about having this place as a resource, that's a really important focus of the farm, people can come and find out things they need to find out, and they can have a go if they want to, if they haven't got enough confidence, like gardening, or working with the animals, or being part of the education project, they

can come and have a go, with the support get confidence, and then take it into their communities and build them a bit stronger. (Olivia)

We observed many examples where economic sustainability, or resilience, was actively pursued and articulated as a constant challenge to the farm. The farm is very creative in its money-generating schemes. It sells products from the livestock such as goats' milk soap, fresh eggs, manure and worm-juice fertiliser. It sells plants, seeds, and fresh vegetables. It holds a market on Sundays during the summer, which raises money and brings people to the farm, thereby increasing exposure and potential future volunteers. It raises money from donations ("*Nine times out of ten [visitors] always leave a donation*" – Mhairi), and saves money by accepting donated plants. Most of the work is performed for free by volunteers. A goat race is held once a year. In 2012 it raised £8000 in ticket sales (and £9500 in 2014).



Figure 25: Queue of people outside Spitalfields City Farm waiting to buy tickets to the goat race

The farm is available for hire as a venue for parties, weddings and dinner clubs. The website has a sponsorship section, where you can sponsor your animal of choice. The farm also receives project funding, such as Lottery

funding. The ability to adapt to economic change is articulated by the manager:

Obviously finance has got to be uppermost in my mind as well to ensure the sustainability of the farm We've never been overly reliant on council funding During the current economic situation the council has been cutting their budgets and the first thing to go is always the voluntary sector Whereas because we've never really had any funding in the first place we've always had to think ahead and to look for different sources of funding so I think we're one up on the game.

For the voluntary sector we're in a relatively healthy situation. (Mhairi)

By being welcoming, free and inclusive, the farm can increase its volunteers and its donations, which in turn contributes to its long-term sustainability.

The volunteer sector and community groups often struggle to increase their membership base, which they rely on to provide their workforce (DiSalvo et al. 2012; Feenstra 1997), and the farm is no exception: “*We still need to get to so many people out there just to come and use the farm*” (Mhairi); “*There aren't enough volunteers*” (Tess).

Gift exchange

This refers to reciprocal acts of giving and receiving, which is common within urban food-growing communities (Mauss & Halls 1954; Hyde 2007). Not only does gift exchange support economic sustainability, bypassing the capitalist model of consumption and production, it also contributes to social sustainability as described by one volunteer:

Oh my god, see, why would I not want to be here when people give me gifts of home-grown broccoli? She didn't just go into a shop and go, oh yeah, I'll have some broccoli. She's grown this, she's tended this, and she remembered, and she's brought it in for me. How good is that going to taste? (Tess)

Volunteers who donate their labour are rewarded with some fresh vegetables to take home. Many people donate plants to grow and sell, with profits going to the farm, without expecting anything in return except a welcome and a friendly space to be.

Care

Conceptualisations of sustainability at the farm are premised on cooperation and sharing, and reflect on the care that people take with each other.

It's kind of about sharing produce together and taking care of others, so you know people are taking care of you and you're taking caring of them. That's the way it works on the garden. (Richard)

The notion of care extends also to plants and animals and the earth.

We're supposed to be a place that demonstrates compassion in farming It's more about the free range and giving animals proper space, and treating them well, as the sentient beings that they are. And not in some little factories, that you just shovel food in and slaughter. To try and make sure that they have a good life. (Mandy)

I'm either seeding them myself or I'm coming to buy them, putting them in the earth, understanding the earth, sifting out the weeds and understanding about what's good for the earth, what's not good for the earth. Being out in the open, making that connection. And hands-on work. (Tess)

The concepts of resilience, gift exchange and care offer alternative discourses of sustainability to those commonly understood within the HCI literature, which are premised on competition rather than cooperation (Dourish 2010), or the rationalisation of lifestyle practices indicative of the sustainable consumption paradigm (Hobson 2002). It is more in line with a discourse of sustainable society that links environmental sustainability and social justice.

For example, Hobson (2002) writes of alternative discourses on sustainable society that link environmental sustainability and social justice:

Rather than linking up efficiency, science and the consumer through voluntary market mechanisms, as the rationalisation approach does, sustainable society discourses link up the moral citizen and personal experience with networked communities that range from global to local, through varied forms of overt and discrete social action ... Sustainable living is no longer just about consuming products but about how social and environmental resources of common good(s), spaces, networks, futures and relationships need to foster respect for each other and, in turn, for the environment. In this sense, the environment is not (just) about “nature”, but about the total environment of lived spaces and daily experiences, the urban experience that is part of modern environmental histories. (Hobson 2002)

Thinking about care, gift exchange and resilience is not about making personal sacrifices, scarcity, competition or the rationalisation of lifestyle practices (Hobson 2002). Rather, by taking care of ourselves and other species, we can create abundance and plenty, enough for all.

Education

Like sustainability, education is a core value and a holistic process that permeates all aspects of the farm. In fact, education is seen as a necessary part of sustainability. New approaches are being explored to foster greater symbiosis between the areas of animal and vegetable care. Gardeners are being educated as to which weeds could be fed to the animals while farmyard workers are being encouraged to let the chickens forage and fertilise the gardens in situ. Small window boxes outside the chicken barns display growing examples of chickweed as an educational prompt.

In terms of composting, rather than throwing all the weeds onto one big compost heap, things like chickweed could get used to supplement the

chickens' diet. But this is an issue around education and communication of volunteers, so they know what and how and to whom to feed which plants. (Mandy)

There is a dedicated education officer who organises regular school group activities, both on and off the farm grounds. She explained that one of her educational interests was in exploring how looking after animals and plants relates to how we look after ourselves. She was interested in “*keys into learning*”: innovative ways that would potentially harness new or digital technologies to help people access the knowledge and information at the farm in a way that was not too directive or didactic.

Many of the activities at the farm offer opportunities for learning and participation, including the volunteering opportunities and workshops. Examples include learning about growing and preparing exotic vegetables; gaining practical knowledge about animal husbandry; and learning how to sew and repair clothes. Dotted around the farm are information boards aimed at educating visitors and volunteers about the various aspects of the farm, such as composting, and life cycles. Capacity building builds on educational values by teaching new skills to local communities.

In the workshop stage of our study, there were many discussions about the need to communicate educational content relating to: composting, medicinal properties of plants, culturally specific information about plants such as which parts are good to eat, and different ways to prepare them, etc. Interviewees spoke of the need to educate visitors, staff and volunteers about compassionate farming (e.g., explaining to visitors about the hens rescued from battery farms), about plants that were traditionally used for dyes, about sustainable horticultural techniques, about the history of plants, and about how to grow food.

Challenges to the educational drive at the farm include signage, which is often inadequate or poorly maintained, and a lack of available staff that visitors can learn from.

I want people that come and visit, I would like them to not only to really enjoy their time, but maybe also to learn something too. And that's also one of the reasons I want to put up more educational signs, things like that, because I think not everybody has the courage to go up to somebody that works here and ask them a question. (Mandy)

Well-being

Against the background of poor health and socio-economic level, the farm works to encourage physical, mental, social and environmental well-being on a number of levels.

Growing and eating healthy food

The farm runs a Healthy Eating programme, which aims to provide fresh vegetables to local people, as well as to educate them to grow and prepare them. Most events include a free healthy vegetarian lunch cooked freshly by volunteers, with produce picked from the farm. Volunteers usually take home fresh produce at the end of the day, and any surplus is sold at low cost to the local community.

The Coriander Club caters to local Bangladeshi women – many of whom don't speak English, have health-related issues such as diabetes, and suffer from depression and social isolation due to limited opportunities to meet with others outside the home. There is a section of the farm where they can cultivate Asian vegetables, socialise with other women who speak the same language, and engage in gentle physical activity outdoors. In the study workshops participants identified a need for an outdoor kitchen and more land in order to fulfil the demand from local people to grow more fresh, seasonal vegetables. They also spoke of the need for a heated greenhouse to allow for seeds to be planted earlier, which would in turn mean that more plants could be sold to the local community, thereby generating greater income for the farm. This was especially important for plants that the local Bangladeshi communities sought

out, such as kudu, chillies and aubergines, as they are particularly sensitive to the cold.



Figure 26: Schedule of growing, harvesting and cooking sessions

Richard, discussing the therapeutic value of gardening for his ethnically diverse groups who suffer from poor physical and mental health, explained the value of fresh, locally produced food:

A lot of them are from farming backgrounds so it's sort of like it reminds them a lot of home and they're getting enthusiastic about things they know from home and flavours they know from home. And they're a bit like other farming communities that we have here in that they're quite demanding about freshness of food. So they really value fresh food and they recognise fresh food. So they're really quite excited with not having to deal with what they get in the shops that's looking quite tired.
(Richard)

As I noted in my field notes, Lutfun, who is in charge of the Coriander Club, which caters to Bangladeshi women, and who is a master grower of Bangladeshi vegetables, spoke to me in one of the volunteer gardening sessions about how she manages the demand for fresh local food from the local Bangladeshi community. She said it's a fine balance between supplying

the freshest food to the local community, and in maintaining a visual display of growing produce at the farm that is attractive and inviting. If she sells all the produce that is in demand, then the farm will look empty. So sometimes she has to say no to people, and they don't always understand and they can get upset and angry, especially if they see she has just sold some to someone else. She explained that local Bangladeshi people want the freshest of the freshest produce. They want it straight out of the ground. If it was cut a few hours ago, they will argue with Lutfun to have it even fresher. They want to harvest it themselves, but she won't let them, because they will choose the best bits for themselves and leave a mess behind. So she has to manage everything, the crop rotation, planning each stage well in advance so there is fresh food available all year around. (From field notes)

In and of itself, eating fresh, seasonal and local food is considered therapeutic in addition to the complex social and cultural well-being people gain from it. As Mandy explained, *"I think everybody wants to get a quick fix, that magic pill that's going to fix everything and they forget the fact that what food we put in really dictates a lot of our health"*. Tess: *"I got an enormous benefit from eating the vegetables"*.

Recovery

The farm offers a non-judgmental, supportive and healthy place for people to recover from various conditions, including physical and mental illnesses, alcoholism and other addictions. One volunteer credited the farm with saving her life:

Four years ago I was diagnosed as being chronically ill ... so I was basically dying Here I am four years later. A different person There was something therapeutic about just digging over As I was digging I was thinking what am I doing with my life. How can I change? As I was ... turning over the soil, I think I was mentally turning over my inner thoughts. (Tess)

Another volunteer described volunteer gardening as a way of improving her mental well-being:

It was kind of also a way of me getting out of the house, because ... I was getting kind of ... discouraged about ... not getting [job] interviews ... so it was a way of ... structuring my day a bit more too so that I wouldn't be stewing over things and just filling applications all day long. It was good to be outside interacting with people. (Mandy)

Connection with nature

The farm offers people the opportunity to escape the nearby financial district of the City of London and the hectic pace of London life in a place that was, despite the train line running overhead, described by a workshop participant as a “peaceful oasis”.

I liked the fact that I could see open sky Being around animals, just hearing natural sounds, kids laughing, animals, breathing in fairly clean air that wasn't off the Hackney Road. (Tess)

The experience of nature and wilderness emerged as a fundamental need and value of the people involved in the farm. In particular, the experience of nature in solitude was seen as a positive value, as indicated in this workshop participant's response to the question, “What place do you like on the farm?”: “Farmyard/stables early in the morning (quiet, no one about)” (participant notes from Workshop 3).

Interviewees spoke of the activity of gardening at the farm as a meditative or spiritual experience.

It can be very serene. In a lot of ways it's better than yoga, of having that moment, with nature, quiet time. But also I'm a plant person. Still I'm surprised how amazing plants are, you could get a huge plant out of this teeny tiny seed. It's inspiring, the amazement of it, kind of makes you feel like a kid again. (Mandy)

Lutfun quite often left me on my own, so I was in my own sort of silence. I found it very meditative Some people sit cross-legged, and say “om”. This to me is my meditation. (Tess)

[Gardening is] just one of those things you get into the zone with, and you just really really enjoy yourself while you’re doing it. Not every time, but really frequently and it ends up being something that you just love doing. (Richard)

Simply being surrounded by nature, which allowed for a connection with plants and animals, was considered relaxing and good for the soul.

There’s something soothing to be around plants and flowers.
(workshop participant notes from Workshop 3)

It’s good for the soul to be able to see these things, and to connect with them. (Tess)

Technology use on the farm

This section describes the uses and non-uses of technology on the farm. I begin with attitudes towards augmentation of gardening practices, followed by mobile and communications technologies.

Resistance to augmentation of gardening practices

Despite the plethora of commercially available sensor-based products that either support automatic watering of plants or let users know that plants need watering or a change in nutrients, the findings from the study indicate that such automation systems may not be in keeping with this farm’s values.

Community members reflected that such technology is not trustworthy. For example, in Workshop 4, it was mentioned that an automatic watering system in the polytunnels had been tried but had not worked and was abandoned (from workshop diagram). Richard thought that a sensor-based system might help where water conservation was important, but recognised that

“Technology can begin to alienate people. And can be completely overwhelming when it starts to break down, as technology does”.



Figure 27: Technology use on the farm

Tess was more vociferously opposed to the idea: *“I bet you if a machine had sensed that [the plants] were like, oh, wilting, it would’ve said, dig ‘em out. It was just me, the human, thinking well I’m going to leave it, and two weeks, and look at them now”.*

Because technology is not reliable, experienced gardeners felt that sensor-based systems would create more work in the long run. Gardening was seen as a common-sense activity by many, requiring little more than physical labour and a connection with nature, which automated systems would compromise:

It’s laziness. You just go out and you look at the soil, and you can tell because the plants will be wilting. If you’re being sent an email, and you just go out blindly and just water it. And if you’re getting an email that means you’re going to have a watering system. So where’s going to be the connection? You need that input, you need that interaction.

(Tess, volunteer)

However, although initially resistant, a staff member and professional gardener at the farm (who taught gardening skills to beginners off-site) thought that in some cases sensor-based systems could help build confidence in complete novices who did not know when the right time was to water. This attitude was repeated by another volunteer, Mandy, who said,

That might be helpful to someone who might be starting gardening, and that's kind of a way to maybe encourage them till they get to that point where it's second nature Because I think that's the issue we have a lot with volunteers here is, everybody's capable of gardening in some sense, it's just a lot of them are nervous, and they need the encouragement.

Mobile and communications technology

The farms users are diverse in terms of language, age and socio-economic background. Many do not use mobile phones, let alone smartphones. In the fifth workshop, which focused on the uses and non-uses of technology on the farm, seven out of the eight participants stated that they own a phone, but only two of them owned smartphones, and only one used mobile internet. Half had a Facebook account. During the participant observation stage of the study, I was struck by the lack of people interacting with mobile phone technology at the farm. This was true of staff, volunteers and visitors. The nature of the work itself, which is often manual, constant, and involving dirt and manure, is incompatible with talking on a phone; a high value is placed on face-to-face communication; and it is also partly due to age, language and socio-economic background of participants.

The one place where there is a lot of digital computing is in the office, where there are eight desks with computers. There is Wi-Fi, a printer, and landline telephones. However, communications technologies were not always up to date or adequately maintained, and staff identified potential for technology to contribute to outreach, education and internal and external communications.

While there is an email list for staff, it is interesting to note that there is no mailing list (email or otherwise) for volunteers. Volunteer gardeners are sent group emails in a disclosed email list. There was no straightforward way for us to email all farm volunteers.

The lack of technology at the farm is typical of community-based Participatory Design projects because community-based organisations are often poorly resourced and have inadequate or outdated technologies (DiSalvo et al. 2012). This is due to stretched budgets for technology and a lack of training and personnel with technical expertise (Dantec & Edwards 2008) and outdated information management practices (Carroll 2008).

The farm has a website, a Facebook page, a Twitter account, a manager's blog and a community gardening blog, all of which are maintained regularly by staff (apart from the manager's blog, which was maintained sporadically and only for a few months), and have been credited with increasing numbers of visitors. The farm is also part of various environmental networks, with featured web pages on some of them.

We have seen numbers go up. That's because our profile has increased through things like Facebook and Twitter and the website.
(Mhairi)

Community members saw potential for communications technologies and social media to increase the effective running of the farm and to encourage people to participate in farm activities. Richard thought it would help the Spiralfields community garden to be less reliant on staff.

One idea that we had for the community garden is that long term it would be completely self-running and wouldn't involve a member of staff at all And I still think that would be possible if we could get on top of our information technology, whether that involves digital technology or whether that involves really clever blackboards. Some sort of way of sharing information effectively and simply between

people I think could really enable a community of people to come together in a fairly small space and produce a lot of food. (Richard)

Mandy felt that social media and communications technologies had the potential to educate people from the wider public about nature and get them more engaged.

I think in communicating and education it could be very beneficial, because you could think about everybody who's attached to their phone nowadays, BlackBerrys and everything, like if there's a way you could find to educate them about the outdoors via something that they've already got attached to themselves that they're addicted to. I think that would be worthwhile. To ironically have something on them that encourages them to put it away and interact with nature a bit more. (Mandy)

Communications between staff members was cited as an area where communications technologies might help address existing challenges for sharing information about the running of the farm.

What ends up happening is you have these little pockets of conversation and then it might filter through to everybody, or it might not, through word of mouth Because what happens is you think about things that need doing as you're walking around, not really as you're sitting at your computer. So what would need to happen is you've got ... your conversation with two or three people, go back to your computer, and send a staff email around ideally, so that everybody knew. But because everybody's so busy, and caught up in their own project areas, you forget things that are going on. And I think that's the one great travesty at the farm, that there's loads going on in everybody's different project, and actually you don't know about them. (Olivia).

Olivia thought that technology might help in “a *non-typing, non-computerised*” way.

Methodological tensions

In this section I reflect on the methods employed in the exploratory study and how they worked or didn't work in addressing the study aims. I do this by presenting a set of methodological tensions that arose through the community-based Participatory Design exploratory study at the farm that include what worked (how the methods succeeded in addressing the study aims) as well as what didn't work. I organise them into the following themes: *The need to plan vs the need for flexibility; Open-ended vs requirements gathering; Tensions in roles and relationships.*

The need to plan vs the need for flexibility

Redhead and Brereton (2010) have highlighted that, when conducting participatory research with community-based organisations, it may be difficult to find reliable participants as these communities are often volunteer-based and people may be unable to commit to a series of workshops or put in the time required. Volunteers may have irregular schedules and people's commitments to the community may be fleeting (DiSalvo et al. 2012). This was certainly my experience of the farm during the workshop stage of the study.

I had originally hoped to give participants a type of cultural probe exercise (Gaver et al. 1999) or something based on the sensitising packages of generative techniques (Visser et al. 2005). For example, I had considered giving workshop participants tasks to complete with a digital camera, audio recorders and notebooks, with which they could document moments throughout the day as they went about their activities on the farm. I had hoped that this would be a way to gain insight into the mundane everyday nature of people's routines on the farm, and at the same time to make the familiar

strange (Bell & Sengers 2005). We would then use these materials as discussion points in the workshops.

However, a number of factors prevented this from being practical. The main one was the drop-in nature of the farm. Mhairi the manager agreed that it was difficult to get volunteers to commit to a series of workshops, and that a drop-in workshop was more likely to succeed:

Because it's not rigid. It's not set. It's not a case of "well you didn't come last week, so you're not coming this week". You start putting boundaries in place for people and they just rebel against it. I think there's nothing nicer than being much more fluid, and they can come in as and when it's convenient for them We're running a project that I had inherited from somebody else and it was quite rigid and strict ... and you had to come for six sessions, and that doesn't work and we found that running one-off taster sessions with people works.

Therefore I felt it was not practical to give them a camera and a series of tasks that they would need to complete over time and ask them to commit to a workshop. Likewise, staff hours had recently been cut due to a lack of funding, and they were extremely pressed for time. Staff members came and went to and from the workshops, if they came at all.

Although I accepted that I could not rely on participants to commit to a series of workshops, I was somewhat surprised that participants came and went within a single workshop according to whether they had other jobs to do.

This presented the challenge of structuring the workshops to be flexible enough to allow for people to join in and leave at any stage throughout. I had to adapt the workshops to fit in with staff and volunteers' existing activities. For example, one week staff held an impromptu meeting on the same day and time as the workshop, and I was left with only two participants.

On one occasion, instead of trying to schedule and run a workshop, I acted flexibly on the spur of the moment in accordance with my own feelings and

intuition about the local situation and decided to make a fire and have some food and a chat with people instead. One staff member, Lutfun, volunteered to take time out from gardening to help build the fire and fry up some poppadums. This relaxed activity, which was culturally appropriate (Brereton et al. 2014), offered me insights into a popular recurrent activity at the farm, and it attracted a large number of staff who abandoned their tasks to come to the fire, whereas I had previously felt a level of reluctance from staff to participate in the workshops. Brereton et al. (ibid.) describe these relationship-building activities as “*reciprocity*”, and suggest that they may be more important than ethnographically inspired Participatory Designs as reciprocity builds mutual trust, engagement and benefit. Responding flexibly to the situation was a chance for me to build relationships and mutual learning in a relaxed situation, built on reciprocity and compatible with the local sociocultural practices of the community.



Figure 28: Lutfun cooking poppadums on the firepit (she did not want her face photographed)

Responding flexibly allowed for relationships and ideas to evolve organically, and for serendipitous encounters. But it also evoked feelings of anxiety about my inability to plan adequately or collect the data that I needed.

Clarke (2014) has discussed similar tensions in her PhD work in a women's shelter using socially engaged arts methods, when struggling to maintain this balance.

I highlight the advantages of staying open to different kinds of informal engagements and formal workshops with people that allowed for complex understandings of competing agendas to be shared, but also serendipitous encounters, diverse relations and lateral connections to be made. Staying flexible, responsive and adaptive with such approaches to engaging the community with research was crucial not only as a way of producing or collecting data, but also as a way of highlighting what people felt was valuable, and aspects of what I and others understood had changed over extended periods of time such approaches are particularly suitable for the early stages of long-term community-based design projects, where relationships are still being formed and identities are still being negotiated The adverse effect of this openness is that it created uncomfortable experiences of 'not knowing', feelings of vulnerability, being overwhelmed, and a loss of control of the process, not only for me, but for staff and volunteers.
(Clarke 2014)

Open-ended vs requirements gathering

Throughout the workshop series I experienced a tension between wanting to collect concrete information to answer specific questions, and a more exploratory, open-ended approach. This is similar to the previous tension of needing to plan versus staying flexible and the demand on researchers to tolerate uncomfortable feelings relating to a level of the unknown and lack of control of the process and its outcomes. Part of me wanted to find the problems in the current approaches on the farm and then develop solutions to those problems, such as via the Participatory Design techniques of Future Workshops (Müllert et al. 1987) and *anchoring* and *transcending* (Iversen & Dindler 2008) that I drew on in Workshop 4. But the other part of me wanted

to keep it much more open-ended and to simply explore the farm in general and provoke inspirational responses from the unknown community in the style of Gaver's Cultural Probes (Gaver et al. 1999) without the intention of producing something immediately useful. I tried to keep in mind that, rather than collecting concrete requirements data that would feed directly into a future design, the workshops could serve as inspiration and a means of getting to know the site.

As I discuss in the following chapters, this is something that I continued to grapple with throughout the PhD research: the seemingly conflicting desire to make something that is of measurable benefit and concretely useful to the farm, versus the desire to create something more playful, ambiguous and open-ended.

The aim of drawing on techniques inspired by art and design, such as Cultural Probes, is to develop people's creativity when responding to certain questions and themes. This offers a way to understand the local culture without "*focussing on needs or desires [the participants] already understood*" (Gaver et al. 1999), which, as mentioned in Chapter 2, is the limitation of traditional data-gathering techniques such as interviews. This was certainly my experience in the exploratory study, in which the creative workshops at the farm opened up new spaces for participants to explore their experiences, needs and values, as well as potential future uses of technology, in a way that the interviews did not.

These playful and open-ended approaches are appropriate for the cultural and creative concerns of community-based Participatory Design that aim to problematise technological solutionism and, through creative and generative workshops, aim to create more playful imaginings of the complex issues and concerns of people's lives (DiSalvo et al. 2012).

For example, in an interview conducted on the farm, one staff member explained the internal communication problems at the farm. When I asked her in an unrelated question how she thought technology might be used on the

farm, she said she thought an interactive whiteboard might help relay information between staff in the office. These answers reflect her current understanding of and familiarity with the needs of the space and the available technology. In contrast, workshop techniques succeeded in developing participants' creativity by defamiliarising the everyday (Bell & Sengers 2005), provoking reflection (Sengers et al. 2005), and helping to open up new spaces for design by creating inspirational responses from the unknown community (Gaver et al. 1999). For example, the first workshop produced design ideas for a humble pot that looks after its plant by feeling responsible for it, embracing it, and moving it in and out of the sun. The solar-powered watering hose seeks out thirsty plants.

Once again, all this openness created in me uncomfortable feelings of not being in control, and an anxiety that I was not producing enough requirements data around specific questions – data that I could draw on to inform the future research through design studies.

It was helpful for me to remember that in Participatory Design there is as much emphasis on the process as on the designed outcomes (Robertson & Simonsen 2012). The more open-ended, creative and dialogical workshops (e.g., Workshops 1, 2, 3 and the fire) were certainly a valuable part of the process, helping to create rich social encounters and build relationships between me and the community, and between members of the community who may not have had many opportunities to be in dialogue with each other. These events were engaging and enjoyable for participants and myself, for example during the gardening sessions. They allowed for diverse people to be involved and to have their voices heard through engagement with non-technical and often non-verbal means (Bannon & Ehn 2012), thereby contributing to the evolving relationships between myself and the participants, and creating rich materials that would serve as inspiration for future designs.

This lack of a clear goal sometimes led to messy results. In Workshop 3 I asked people to map both their ideal farm and the farm in relation to the city –

all on the same map. This lack of a clear goal caused some confusion for participants and the results are certainly fragmentary and multilayered. As Vissar et al. (2005) write about generative techniques, “*a clear goal statement is especially relevant, as the resulting data is fragmentary, multi-layered and consists of individual stories, which makes it difficult to create hierarchical structures*”. On the other hand, the workshop did succeed in producing rich and evocative information about people’s desires, values, and concerns in the context of their lives and the farm environment. It also created a social space, where people from the community came together and engaged in dialogue.

Workshop 4 was more about requirements gathering, discovering attitudes towards technology, and problem solving. The workshop was not very successful in terms of developing creativity, or creating a rich social encounter or event, and I think that, although I got the concrete data I was after, it was not very enjoyable for myself, nor, I suspect, for the participants.

Tensions in roles and relationships

Another tension I experienced throughout the fieldwork was in relation to my role in the research process.

The Participatory Design literature highlights the changing nature of the roles between designers and users. In Participatory Design, participants are involved in the research in a much more direct, active and creative way than in more traditional software and engineering design methods (Sanders & Strappers 2008). The role of the researcher is not just to gather requirements data from a subject and translate these for the designer, where the designer is the expert and the user is defined by their use of the design (Wright & McCarthy 2010). Participatory Design methods can help overcome the limitations of traditional science and engineering methods that emphasise step-by-step procedures and clear-cut specifications, and prevent creativity from flowing and cooperation from sparking between designers and users (Greenbaum & Kyng 1991).

In many ways I took on the role of facilitator: I planned and ran the workshops as events at which farm members could get involved in engaging social encounters, have their voices heard, and think in new and creative ways about their concerns and experiences.

For example, in the mapping workshops, I was the facilitator of the event, of the social encounter. The room became a social space, with more and more people stopping by to see what was happening, contribute to the maps, and have a friendly chat (from field notes). This facilitation role allowed for cooperation and creativity, but also contestation, and for divergent voices within the community to be expressed. The participatory mapping workshops (2 & 3) in particular offered scope for dialogue between participants. This dialogue ranged from cooperation to near conflict. For example, in Workshop 3, one participant drew a storytelling area on the visionary map. Concurrently a second participant drew an animal-maze layout to the farm. Together, these prompted a third and a fourth participant to cooperatively work on a design of a section of the farm inspired by children's stories, and intended to inspire the telling of stories. To contrast with the cooperative dialogue of the previous example, in the second workshop (first mapping workshop), one staff member contested the lines drawn by a volunteer and redrew them according to her version of the farm. The renaming and redrawing of lines and objects on the map seemed almost political, reflecting the investments that people have in the different aspects of the farm. The map reflects this dialogical process and the personal investments in the farm and as a result offers rich information about the farm. Facilitating this event allowed differing voices to be heard, highlighting how different subcommunities exist within the farm community, and how these may have conflicting needs (Hirsch 2009).

Understanding my role as a facilitator implies stepping back, not getting too involved, and allowing things to emerge from the community. There were times, however, that I felt that I needed to get involved as a participant. While I was conscious of needing to avoid overly steering the direction of the

conversations in the workshops (for example, when choosing concerns to elaborate on, or possible design solutions) I also tried to contribute to this process as a participant and not to stand aloof. For example, I helped to fill in the maps in Workshops 2 and 3, and in Workshop 4 I added my own concern/problem about the farm – namely, the lack of signage, which is something that had been brought up previously by others, and which I also experienced as a problem. This was then chosen by the group to take to the next stage of the workshop, in which we envisaged a solution. While it could be construed that I was directing this process too much, in this instance it felt to me that my participation was part of the dialogical process that I was striving for. This tension is echoed in Vines et al. (2013): “*while control is certainly shared [in participatory research], it must not be forgotten that the researcher is as crucial an agent in the participatory process as any other participant*”.

At other times I tried to present myself in the role of farm resource. I did this by telling people about my research interests, stating in all encounters throughout the study that I was interested in finding ways for technology to support the community. In this way I hoped to encourage potential collaborations, by making myself approachable, accessible and available to the community. To an extent it worked: people started to approach me – outside the workshop or participant observation sessions – with ideas they had for technology on the farm (e.g., Olivia wanted me to set up a time-lapse camera of the growing areas; Esther wanted me to make a chicken sound installation).

However, stepping into the designer role, I was not sure I wanted to pick up on these suggestions and take them forward in the following research through design studies. I noted in my field notes how there were so many creative ideas floating around on the farm, and the tension I felt between wanting to catch those ideas and develop them, while another part of me wanted to start something completely new. These reflections highlight the tensions I

experienced: on the one hand seeking out collaborators and presenting myself as a resource for the farm that members of the community could call upon, and on the other hand maintaining control of the decision-making process. Although Participatory Design recognises users as experts of their experience (Sanders & Stappers 2008), this does not negate the critical role that designers play in giving form to the ideas (Vines et al. 2013).

Understanding these roles and relationships through the dialogical perspective of Wright and McCarthy (2010), as described in Chapter 2, may help to understand and smooth away some of these tensions, by acknowledging their evolving nature through the dialogical process:

The designer is not a detached isolated individual who observes but does not affect that which is observed in order to derive in the logical implications of design propositions from the abstract user data. Instead, the designer is involved in dialogue with the participants, each person trying to understand the other's point of view, and their needs and desires, and trying to understand how best to contribute something to the growing mutual understanding of the current situation and possible futures. The designer and the user are both changing the situation (as a form of inquiry) in order to learn from it and understand how to go on.
(Wright & McCarthy 2010)

Mutual learning is also part of this dialogical perspective within Participatory Design (as described in Chapter 2), in which the emphasis of design is on *"establishing, developing and supporting mutual learning between multiple participants in collective 'reflection-in-action'"* (Robertson & Simonsen 2012).

This resonates with my experience of the exploratory study on the farm, in which the methods I used certainly contributed to a dialogical process between myself as researcher-designer-facilitator-participant, and members of the farm community as participant-expert-co-creators. Within this process we changed our understanding of the situation. For example, as I was interviewing one of the staff, she explained some of the problems on the farm,

and, through the process of talking with me, elaborated solutions to those problems herself which she had not thought of before.

Understanding these roles and relationships through the dialogical process allows for the rigid definitions of facilitator, participant, user and designer to become more fluid. I pick up on these tensions in subsequent chapters.

Opportunities and implications for design

In this section I reflect on how the thematic analysis described above could inform my designs with the community. Presented as a set of opportunities and implications for design to support the values, needs and practices of the farm, they are used to drive the research through design case studies, which I describe in the next two chapters (Chapters 5 and 6). In the final Conclusions chapter (Chapter 7) I reflect on how these informed the research through design case studies. I also present here a sample of ideas and design concepts that were generated in the exploratory study.

Design for inclusion

The urban landscape and the way we interact with it is changing as mobile technologies become an ever-increasing medium through which we communicate (Paulos & Jenkins 2005). One study that looks at designing technology to support the urban homeless suggests that efforts in urban computing are inherently exclusive as they do not engage the breadth of social diversity (Le Dantec 2008). Le Dantec argues that the main factor for exclusion of the homeless from this ever-changing landscape is financial – homeless people simply cannot afford to own and use mobile phones, let alone smartphones. The findings from the case study at Spitalfields City Farm indicate that additional exclusionary factors may include people's age, technical proficiency and language, as well as people's preference to not own a smartphone or other mobile device or carry one around when engaging in

gardening activities. As inclusivity is one of the core values of the farm, the danger in designing for pervasive or mobile computing is that large sections of that community may be excluded from the design. This suggests that design to support the farm's value of inclusion may need to look beyond traditional screen, mobile and text-based technologies.

A more inclusionary approach than to design apps for smartphones might be to design interventions into the public fixtures of the urban environment, with which all sectors of the population can interact regardless of age, language or technical ability. This suggests opportunities for embedding interactive technologies in everyday objects. For example, one idea that arose in the workshops was interactive listening stations to play back animal sounds, as an educational resource. Another was for an interactive map at the entrance to the farm with a touchscreen interface in different languages. It would tell you the timetable of activities and opening hours, explain that entrance is free, indicate available staff who speak Bengali, and give details of plants that are currently being grown, what is available to buy, recipes and hints and tips for growing, as well as providing information about the medicinal and health properties of plants on the farm. It would foster inclusivity by providing information for people from different ethnic backgrounds and languages, and helping the farm to be a welcoming and accessible place to visit.

Design for education and participation

Baumer and Silberman (2011) argue that a more effective way of protecting the environment than designing smartphone apps to change individual consumer behaviour is through educational programmes, information panels and community outreach. The participatory workshops highlighted a number of opportunities for technology to augment and amplify the existing educational and outreach work of the farm, for example through social media and communications technologies. More specifically, there is a rich space for design to help disseminate knowledge about sustainable practices such as composting, animal/plant symbiosis, and information about growing and

preparing plants such as recipes, and medicinal knowledge, and the joint collective knowledge of growing held by all the diverse community members.

For example, after the last workshop, Esther, the education coordinator, approached me and explained her educational interest in exploring how looking after animals and plants relates to how we look after ourselves. She was interested in “*keys into learning*”: innovative ways that would potentially harness new or digital technologies to help people access the knowledge and information at the farm in a way that was not too directive or didactic. For example, we discussed the possibility of augmenting the plant labels that were dotted around the farm and displayed information about plants with new technology such as RFID or QR codes. People could then access this information, looking for tags as if on a treasure hunt or tour around the farm.

We discussed how they could incorporate the community’s collective knowledge of plant growing and preparation, incorporating the diversity of cultures and backgrounds. This could help build a rich, dynamic and collaborative knowledge base and encourage more people to get involved in growing their own food in the city. Similarly, there were suggestions for technology that could encourage people to get outdoors and spend more time in nature by “*ironically*” putting the technology away (Mandy). This would help support the value of well-being through connecting with nature as discussed above.

Participants expressed the need for any technological intervention to be unobtrusive and sensitive to the natural environs of the farm. For example, it was discussed that a museum-style push-button display that communicated to visitors information about certain places of interest around the farm was inappropriate to the natural organic materials and wild aesthetic of the farm. However, in other discussions, the possibility of a large interactive map was discussed in a positive light.

Design for face-to-face communication

While there is much work being done around social networking and other technologically mediated communication and online communities, gardening offers people opportunities to get together and engage with other humans face to face. This has a number of benefits. It is well known that social connectedness is necessary for quality of life and mental and physical well-being (Kaplan et al. 1988). Conversely, loneliness and social isolation are linked with adverse health effects (Kawachi & Berkman 2001). Although many of our daily interactions have become technologically mediated, *“there are severe doubts whether mediated communication can afford the same affective characteristics as face-to-face communication”* (Baren et al. 2004). Gardening together helps build a sense of community, which is linked with subjective well-being (Davidson & Cotter 1991). This is based on people getting together in a shared activity in the same space and time, and caution must be exercised when designing with technology. As Bell et al. (2005) indicate, there is a social price to pay for designing for efficiency in everyday practices, which often rely on serendipitous encounters and face-to-face communication (Bell & Sengers 2005; Foth 2006). As discussed above, many people choose not to use mobile phones and laptops when engaging in activities at the farm, and the introduction of web, mobile and screen-based platforms risks compromising existing face-to-face communication.

Unlike online communities, co-located communities are often built around serendipitous and coincidental chance encounters within a real spatial location (Foth 2006). In the exploratory study, the lack of an indoor community room was cited as a key need on the farm – a place where people could meet away from the usual routine activities, and have a cup of tea and a chat. In lieu of such a room, I see opportunities for a technological intervention in urban food-growing communities to support this need for people to come together and encourage serendipitous meetings beyond the usual routine activities. I imagine that such an intervention could be in the form of a

discussion piece, an everyday physical object augmented with digital technology that is constantly updating, drawing people to it as they traverse the farm in their routine activities, and provoking discussion, and in this way supporting the social interaction of the community.

Efficiency is overrated

Traditional HCI is concerned with making processes more efficient, for example through the concept of usability, which focuses on preventing errors and other factors that make a system slower to use. Design for increased efficiency in everyday activities, such as cooking and cleaning, is the subject of much recent research. As one of the main challenges for gardeners is managing the water supply to plants, this research typically takes the form of sensor-based automatic watering systems. On a community gardening site, which relies on an erratic volunteer task force, watering becomes a serious issue. A brief internet search uncovers a plethora of commercially available sensor-based products that either support automatic watering of plants or let users know that the plants need watering or a change in nutrients. One open-source project, Botanicalls,¹⁰ offers a ludic solution in the form of plants that text or tweet, while another, Re:farm the City,¹¹ creates a shared knowledge base and provides support from online communities. Designers might expect that sensor-based systems to augment the practice of gardening offer the potential to make a positive contribution to urban agricultural communities.

Yet, if we look at the key values of the farm, such as community inclusion, education and social sustainability, automating the gardening systems through ever more sophisticated sensor-based technology may not be in keeping with what the farm is trying to achieve. Many believe that gardening is a common-sense activity that requires physical labour and an embodied connection with plants. Furthermore, technology is viewed as unreliable and

¹⁰ <http://www.botanicalls.com> (accessed 8th October 2013).

¹¹ <http://www.refarmthecity.org> (accessed 7th October 2013).

untrustworthy. The worry that automated systems would create more work in the long run, as expressed by one of the farm's staff, mirrors research from Bell et al. (2005), who discuss domestic technologies and in particular technology to support domestic food preparation. Designing such systems for efficiency is often a false economy where one type of work gets substituted for another. In addition, there is often a social price to pay for optimising and standardising everyday activities (ibid.).

Odom's study found that gardeners feared an over-reliance on such sensing systems, as it such would subvert members' ongoing development of environmental knowledge, and would remove opportunities for building relations between new and experienced gardeners and beginners through "*social interaction and informal transfer of tacit knowledge*" (Odom 2010).

This is echoed in Baumer and Silberman (2011), who suggest that a social approach to sharing knowledge about gardening "*may have the additional benefit of creating a community of involved, invested gardener-citizens – potentially ones who, rather than spending time tweaking sensors in their lettuce beds, might engage in civic action toward environmental ends*". As social interaction is often one of the main motivating factors for people to get involved in community gardening, designs must not optimise this aspect away.



Figure 29: Photo of Tesco's home delivery vehicle in Tower Hamlets

I took the photo in Figure 29 in Tower Hamlets not far from the farm. This is the kind of image that urban dwellers are bombarded with. The image reinforces the narrative of efficiency and convenience, one in which food isn't grown, or even picked – it arrives straight to your home after being simply clicked on a computer. It's as though perfectly formed vegetables grow in the digital cloud, disconnected from labour, from people, from soil and from the climate. And perhaps the price to pay here is the alienation from their food production that many modern urban dwellers experience. Such an alienation has been credited with creating an ignorance of where food comes from, the implications of which include an increase of obesity and associated diabetes, which residents of Tower Hamlets suffer from proportionately more, on average, than residents of other parts of London and the UK.

In any case, this kind of efficiency is not in keeping with the farm community's needs or experiences, nor those of other places like it, and stands in stark contrast to the embodied, connected, physical, manual labour of gardening at the farm.

Conclusion

In this chapter I presented an exploratory field study whose aims were to build relationships, to get to know the farm community and for them to know me, and to better understand its values, needs and practices and the ways technology could support the community. The findings indicate that, rather than understanding sustainability in terms of discourses of sustainable consumption, the farm demonstrates a collective, participatory and holistic understanding of sustainability that takes into account social, economic and environmental aspects within contemporary urban life. In this way its practice is more holistic and complex than simply encouraging individuals to behave more in line with what researchers decide is "green". For example, through volunteer gardening sessions, workshops and events, it provides

opportunities for diverse people to get involved, thereby contributing to a sustainable community (Feenstra 1997) and an active notion of community that allows for difference (Nancy 1991; Devadas & Mummery 2007). Similarly, through examples of care, gift exchange and resilience, the farm presents alternative understandings of sustainability that have little to do with individual behaviour change or the rationalisation of lifestyle practices that is common within HCI. Its environmental work not only includes food growing and healthy eating activities, but also builds capacity by strengthening knowledge and skills within nearby communities, and takes an integrative approach to the management of food production and waste cycles. In order to do this it must sustain itself financially and socially, through increasing its user base and keeping its constituent communities involved, providing education, and improving health and well-being. For these reasons, I argue that locating research within such sites and learning from them presents opportunities to include alternative voices in the debate about what sustainability means and how this can broaden the design space of sustainable HCI beyond dominant narratives of consumption and individualism within a neoliberal capitalist system.

I concluded the chapter with a set of implications and opportunities for designing with digital technology to support the values, practices and needs of the farm as discussed in the findings. In Chapter 7 I reflect on how the research through design case studies responded to these implications and opportunities and I attempt to draw more general conclusions for other HCI researchers attempting to conduct similar research.

Chapter 5 – The Talking Plants

Introduction

In Chapter 4 I presented an exploratory study that I conducted at Spitalfields City Farm. Through a community-based Participatory Design methodology I aimed to build relationships, to better understand the values, needs and practices of the community, and to explore how technology could support the farm. Drawing on the findings, as well as the literature discussed in Chapter 2, I gave examples of opportunities and implications to inform the subsequent research through design case studies. I discussed how, rather than introducing efficiency-based automated systems to increase productivity, a more appropriate use of technology would be to design inclusive, accessible systems to support face-to-face communication and serendipitous encounters. Designing computing systems to support education, outreach, community building and information displays around food growing was also discussed as a more effective way to help the environment than mobile phone apps for individual behaviour change (Baumer & Silberman 2011; Hirsch 2014; Odom 2010).

In this chapter I build on these findings by discussing the first of two research through design case studies to be informed by them. The Talking Plants was a ludic encounter to learn about growing and preparing edible plants. Through an augmented watering can, visitors to the farm can listen to plants that talk. The plants talk in first person, addressing the listener directly. They each have a persona, and they tell their audience how to take care of them, how to prepare them in recipes, their histories, and their medicinal properties.

The aims of the study were to design with and for the community a ludic encounter with talking plants to contribute to the values of the farm as identified in Chapter 4, and to explore how such a process and the resulting

artefact can broaden the design space of sustainable HCI beyond individual behaviour change.

In the “Phases of activity” section below I discuss in detail how this project came about and evolved through the community-based Participatory Design methodology at Spitalfields City Farm, which included meetings with staff and volunteers and three public demonstrations. I attempt to describe in detail the structure, process and outcomes of the study in order to contribute a rich description of the community-based Participatory Design. This answers the call within the research community to provide more detail and articulation of the design processes and how relationships develop and unfold within Participatory Design research over time (Light 2010; Vines et al. 2013).

The structure of this chapter is as follows: I begin with an overview of the study and a description of the design rationale. This is followed by a brief survey of related work that served as inspiration. I then discuss the different phases of activity and engagement of the farm community. A description of how I applied a thematic analysis of the data collected in the study follows, before I present the findings from the analysis as organised into themes and sub-themes.



Figure 30: Visitor interacting with the Talking Plants

Overview of the Talking Plants

I start this section with a short vignette of the interaction in order to give the reader a sense of it.

Spitalfields City Farm is full of people on a busy Sunday. There is a festive event, with live music, food stalls, and donkey rides for children. A visitor sees a table laden with herbs for sale. Next to the plants is a watering can. A sign indicates that this is a Talking Plant Sale and the person selling the plants invites the visitor to pick up the watering can and touch the spout to the plants, in order to hear the plants talk. The visitor is intrigued and confused, but she does as she's told. A voice emerges from the watering can; it has a pronounced Caribbean accent, and the words are pronounced long and slow.

The visitor brings the side of the watering can to her ear and begins to smile as she listens.

Hi, my name is Lovage. I see you thinking to yourself, "That looks just like Parsley" But let me tell you a secret. I'm much sexier. And if you give me a chance, I'll do you good. I've been cultivated for my extraordinary qualities for donkey's years. I was once considered a wonder drug. You name it, I could heal it: jaundice, colic and fever in children; stomach upsets and problems of the digestive tracts; premenstrual tension; smelly armpits and sore throats, the lot. But here's my real charm. Need a little help in the bedroom department? I can perk you up and get those love juices flowing. Yep, I'm a well-known aphrodisiac, a herb of easy culture and easy propagation. And I've been helping people to get it on for thousands of years. So love the lovage, and I'll give you some good loving in return.

As she listens the visitor does not move very much. She looks intently at the plant that she touched with the can. At one point she laughs. When Lovage is finished she touches the tags of a further two plants, listening to the end of each track, before replacing the can in order to give someone else a turn.

The pre-recorded voices come from the volunteers and staff at Spitalfields City Farm, celebrating the diversity of the community. By basing the content not only on research conducted into the different properties of plants but also on the personal stories of individual staff and volunteers at the farm, the project aims to share the rich knowledge of growing plants from around the world that is collectively held at the farm. The plants try to convince listeners of their charms so that they will take them home and look after them.

Design rationale

The overall goal of this PhD research was to design ludic engagements through a community-based Participatory Design as a way to expand the

design space of sustainable HCI and help move it beyond the dominant narrative of individual consumer behaviour change. Within this overall goal, the particular aims of the Talking Plants study grew out of sustained, long-term and embedded engagement with the farm community.

At the beginning of this study I therefore had a triple focus of:

1. Opening up new perspectives on sustainability
2. Creating ludic encounters that would allow for open-ended reflection, playful explorations and multiple interpretations
3. Supporting the values of the farm as part of a community-based Participatory Design methodology.

The broader Participatory Design work, of which the exploratory study described in Chapter 4 formed the initial backbone, identified the potential for digital technology to support the educational work the farm does around food growing, and to provide the means for visitors and volunteers to find answers to specific questions about cultivating food crops when there wasn't another person with that knowledge on hand. Focusing on education has been highlighted as one way to expand the design space of sustainable HCI beyond individual consumer behaviour (Baumer & Silberman 2011). The aim of the Talking Plants project was to design a system that would support learning about growing edible plants to potential growers and visitors to the farm in an intuitive, simple, enjoyable and informative way. I wanted it to be accessible and inclusive, and not to compromise or replace opportunities for social interactions.

In addition to the findings from this broader Participatory Design work, I was also interested in and inspired by the literature on ludic design as a way to disrupt dominant narratives of utility and efficiency within sustainable HCI. Therefore, I had the additional aims of creating playful, surprising and unexpected encounters with curious systems (Gaver et al. 2013) that would encourage dialogue and new perspectives on sustainability.

The Talking Plants project doesn't focus on reducing household energy consumption. It doesn't focus on scarcity, lack, or making sacrifices. It doesn't ask people to cut down their food miles by reducing consumption of food grown not locally. Nor does it replace existing gardening practices with automation systems. Rather, through the ludic design of the augmented watering can giving voice to plants, it aims to allow for open-ended reflection, and provide a space for alternative understandings of sustainability that are not framed in terms of consumption, individual behaviours, or the rationalisation of lifestyles. "*Ludic design is not just a matter of entertainment or whimsy, but focuses on providing resources that encourage people to explore, speculate and wander, finding new perspectives on potentially serious issues*" (Gaver 2002).

Related work

A number of projects and related work served as inspiration for the Talking Plants project as it evolved over time.

A Conversation Between Trees (Jacobs et al. 2013) was an interactive artwork that aimed to engage audiences with difficult climate change data. Using live environmental data collected from remote forests in Brazil, as well as historical and forecast CO₂ data, visitors could take part in a mobile sensing experience. The study explored how the artists designed for an emotional and sensory engagement with the data as a way to help visitors make sense of them. The authors describe how this treatment of the data enabled multiple interpretations and dialogue.

Artists have for some time explored how to visualise and interpret environmental and locative data through playful, visual and sensory interactive experiences, while at the same time, interaction designers have been developing 'eco-visualisations' to help communicate environmental concerns such as energy usage. (ibid.)

Part of the installation involved visitors walking through a forest with a mobile phone that captures and visualises images of that forest. Another part of the installation involved translating local temperature, humidity, and decibel and CO₂ levels into an animated 3D visualisation.

I was inspired by how the trees serve as a kind of sensor, and how the artwork tries to transmit the hidden information about the trees through emotional and sensory engagement in a way that encourages dialogue between visitors.



Figure 31: Detail from *A Conversation Between Trees* (Jacobs et al. 2013)

Tales of Things (Speed 2010) was a digital platform giving an online presence to everyday physical objects and their stories. It allowed for users to interact with physical objects and access the stories associated with them (and stored online) through a mobile phone application. Developed in collaboration with an Oxfam charity shop in Manchester, the *RememberMe* project used the *Tales of Things* platform to explore how memories that are attached to objects can affect consumer habits. People that donated objects to the Oxfam shop were asked to also donate a story about those objects, which were audio-recorded. Later, people shopping in the Oxfam shop could listen to these

stories via their mobile phones (using QR codes), or with a bespoke reader (using RFID – radio frequency identification tags). The bespoke reader triggered the audio to play over loudspeakers in the shop. People who visited the shop and listened to the audio spoke of the additional meaning that the voices telling the stories gave to the artefacts. “*The project’s emphasis upon personal stories and not quantitative data such as price, temperature or other logistical data, offered a rich immaterial dimension to each object’s material instantiation*” (ibid.). The project resulted in the successful sale of all the tagged items, including those which are traditionally difficult to sell.

I was interested in how the project demonstrated that augmenting everyday objects with personal stories and histories has the potential to tap into existing values, and in this way help sales. Could a similar system help contribute towards the economic sustainability of the farm?



Figure 32: Detail from *RememberMe* (Speed 2010)

Seeds to Soil (Tran 2011) was a grassroots urban food-growing project in Central Harlem that used participatory actions and an online presence to address issues around community cohesion and food security. Visitors to a community garden could plant and take home a mystery seed, before joining an online community where they could share information about their plants

with people they had never met before, but who might be their neighbours. The participatory actions were events where people could meet each other in person and compare stories of growing food. The researchers found that there was a low uptake of the tech elements, but that the participatory face-to-face events were successful in engaging people in food-growing activities.

From this project I was inspired by the community engagement around food growing, and the way in which the digital elements were used to encourage face-to-face interaction in physical space. I was also inspired by the engaging and playful aspects of the mystery seed.

Finally, I was also inspired by the *Talking Quilt* (Heitlinger 2012) which I discuss in the Introductory chapter (Chapter 1), and which was a project that I was involved in at the farm. The *Talking Quilt* was a traditional textiles quilt augmented with digital technology to allow for enjoyable and reflective engagement. Produced by over 80 staff, volunteers and visitors at Spitalfields City Farm, the quilt presented a snapshot of the farm. Audiences could scan the quilt with an RFID-enabled patchwork oven glove to play back oral history interviews with those who helped make the quilt. The technology was used to bring the everyday domestic object to life, to make it contemporary, and to augment the experience of interacting with it without changing its qualities as a visual, tactile and handmade object. Rather than aiming for a solely playful interaction, the project aimed to communicate the socially meaningful themes of food, food growing and community to a collective audience.



Figure 33: Detail of the Talking Quilt (Heitlinger & Bryan-Kinns 2013)

From this project I was inspired by how the quilt celebrated the collective knowledge and stories of a large group of people and made these stories accessible to a wide audience through a fun, playful and engaging encounter with an augmented everyday object. I was also interested in continuing the way in which the project used sound and the element of surprise to bring these hidden stories to life.

Phases of activity

An iterative, phased approach informed the design process of the Talking Plants study. These phases of activity evolved over a period from May 2012 to July 2014.

The development of the Talking Plants project can be described according to different phases of activity:

- Phase 1: Initial design seeds sown
- Phase 2: Involving the community
- Phase 3: Implementation
- Phase 4: First evaluation
- Phase 5: Iteration
- Phase 6: Final evaluation.

The aim of describing these phases of activity in depth is to provide a rich narrative of how I worked in this particular context with a community-based Participatory Design process and how the project evolved in a participatory way. Participatory Design is distinguished from other design practices by its concern with process and not just with the design outcome or artefact (Robertson & Simonsen 2012). In order to answer the calls within the Participatory Design community (Light 2010; Vines et al. 2013) for more detail and articulation of the design processes and how relationships develop, I have attempted in this chapter to provide detailed descriptions and reflections on the process of involving people in the design process.

February 2012– April 2013	April 2013	April–May 2013	May 2013
<i>Phase 1: Initial design seeds sown</i>	<i>Phase 2: Involving the community</i>	<i>Phase 3: Implementation</i>	<i>Phase 4: First evaluation</i>
Exploratory workshops, discussions with community members, Sowing New Seeds workshop, ideas generation	Meeting with farm staff to discuss ideas and start planning	Building electronics. Researching, writing scripts, recording and editing sound tracks. Aesthetic considerations	First evaluation and data collection at Fascination of Plants
June 2013	August 2013	September 2013	September 2013
<i>Phase 5: Iteration</i>			<i>Phase 6: Final evaluation</i>
Meeting with Olivia and Mandy to discuss first evaluation and future directions	Second evaluation and data collection at eco-chic market	Refining the design to incorporate new content for chillies. Content to be delivered in installments of shorter duration	Final evaluation and data collection at Festival of Heat

Table 3: Phases of activity

Phase 1: Initial design seeds sown

This phase of activity took place from February 2012 (start of the exploratory study as described in Chapter 4) to April 2013, and describes the design seeds that were planted during my engagement at the farm that subsequently grew into more concrete ideas for the project. These seeds include relationships I formed with key participants, and various conversations and ideas generated during the exploratory study, as well as different activities and events that I observed taking place at the farm.

During the exploratory study (described in Chapter 4), I identified that food growing and education around food growing are integral foci of the farm,

interrelated to the other core values of sustainability, community and well-being. For example, it was repeatedly brought up that there is diverse knowledge of food growing held collectively at the farm, and one of the challenges of the farm was how to make this collective knowledge accessible and available to others. For example, there are often not enough staff on hand to answer questions from those wanting to grow their own food, or visitors may be too shy to approach someone. We discussed the potential for digital technology to assist in making this information accessible to a wide audience. For example, in the fourth workshop we generated a concept for an interactive map with a touchscreen interface in different languages that told you, amongst other things, what was currently growing at the farm, their medicinal and health properties, recipes, hints and tips for growing, and which parts of the plant you can eat.

As described in the “Findings” section in Chapter 4, education is a core value of the farm. In the “Implications and opportunities for design” section in Chapter 4 I discuss the potential for technology to support the educational work that the farm already does. For example, immediately after the conclusion of the final exploratory workshop, the education officer, Esther, approached me and explained her educational interest in exploring how looking after animals and plants relates to how we look after ourselves. She was interested in “*keys into learning*”: innovative ways that would potentially harness new or digital technologies to help people access the knowledge and information at the farm in a way that was not too directive or didactic. We agreed that push-button technology was inappropriate and wondered how to make technology more integrated into the surroundings. In this conversation we also discussed the existence of signage around the farm, including plant labels. Dotted around the gardens were handwritten labels with information about plants including their name and growing conditions. We discussed the possibility of augmenting these unobtrusively with RFID or QR tags. People

could then access this information, looking for tags like a treasure hunt around the farm.

Other key conversations were held with Mandy, the volunteer coordinator. Mandy has a background in ethnobotany and she was interested in finding ways to educate the public in medicinal and practical uses of plants, beyond the culinary. In early 2013 she was setting up a weavers' garden, to link the farm to its historical location in Spitalfields, which was a centre for Huguenot silk weavers from the 17th century. In this garden she planned to grow plants traditionally used for making dyes and fabrics. She was also organising an event as part of the International Fascination of Plants Day in May 2013 (where we first demonstrated the Talking Plants), which would provide opportunities for the public to engage with the more unusual or scientific uses for plants.

Conversations with Olivia, one of the growing coordinators, also helped to sow the design seeds for the Talking Plants. Olivia was working with different groups to support their food-growing activities. She coordinated a large growing programme and was involved in practical gardening activities with volunteers and various groups, as well as outreach, reporting, education and capacity building with local community groups. At this time she was also involved in the Sowing New Seeds project: a series of workshops run by the Heritage Seed Library from the national charity Garden Organic and held at the farm (as described in Chapter 4). The aim was to increase skills in, and share knowledge about, growing crops not usually grown in the UK. These workshops were attended by people diverse in terms of age, ethnic background, and gardening knowledge. Olivia was coordinating the establishment of small gardening plots at the farm for workshop attendees where they could grow "exotic" crops. For example, there was a new Zimbabwean garden that was tended by a group of women every Tuesday, where they grew crops from Zimbabwe.

My own background and experience with audio-based projects also informed the project. For example, I had previously developed an interactive system to play back audio from a traditional textiles quilt, using an oven glove (discussed in the “Related work” section above and in Chapter 1). The audio content for the Talking Quilt was personal stories around food, food growing and community. Drawing on this previous project, I began thinking of an audio system that could provide information around food growing, celebrate the community, and make available the rich and diverse knowledge around food and food growing that was held collectively at the farm. Rather than an audio tour, I thought of somehow augmenting the existing plant labels with digital technology as a way to provide a playful, intuitive and accessible experience.

Phase 2: Involving the community

As described above, the initial design idea for the Talking Plants had grown out of the overall Participatory Design process including the exploratory workshops, interviews and informal conversations held with members of the farm community, as well as my past experience with sound-based art projects. I was now ready to develop the idea in collaboration with the farm, and to explore how better it could support the work they were doing.

On 5th April 2013 I met with Mhairi, the manager, in order to discuss the idea I had for the Talking Plants. She thought it was a great idea and gave me the go-ahead.

On 16th April I met with Olivia and Mandy to present my initial ideas and explore how the project could support their existing work. They were keen and could see a direct link with their work (I describe their responses in detail in the “Findings” section below). We discussed the idea in great detail in relation to the wider activities of the farm, and set out a plan of action.

We decided that we would present the Talking Plants at four different events over the course of the summer and early autumn. For each of these events,

we would choose a theme for the type of plant and content to display, which would be in keeping with the event. These included:

- five different medicinal plants with medicinal and health-related content for the Fascination of Plants day (May 2013)
- five different bee-friendly plants with content about the uses for bees for the Honey and Strawberry Fayre (July 2013)
- five unusual or exotic plants with historical and cultural content to come from the community (date unspecified)
- five chilli plants for the Festival of Heat (September 2013) with cultural and historical content to come from the farm community.

In the end this proved overly ambitious and we presented the project on three occasions.

With the first event (Fascination of Plants day) less than a month away we determined that there was insufficient time to collect stories from the community. So we decided that Mandy and I would conduct research into the medicinal properties of plants, and I would then write some scripts based on the research. The final audio clips would be edited from recordings of farm volunteers reading the scripts. Both Mandy and Olivia liked the idea of the plants talking in first person and that it “*would be a fun interactive thing that people could do that day*” (Olivia). They also liked the idea of using different voices as a way to celebrate the community, sharing their knowledge and passions.

The kind of passion that's there from people that have been growing things, and actually sharing that is as much as growing the stuff, sharing that kind of knowledge is a really powerful thing. So it would be nice to have those different voices talking about particularly a favourite plant of theirs ... and eccentricities about plants. (Olivia)

Inspired by the *RememberMe* me project (Speed 2010) discussed in the “Related work” section above, we decided to sell the plants, and to see whether the Talking Plants could increase income generation for the farm.

Phase 3: Implementation

I built the different parts of the Talking Plants during the period April–May 2013. This included the different electronic components. It also included researching, writing and recording the scripts that would form the audio tracks for the system. What follows is a description of these different parts and how they are assembled.

Aesthetic considerations

Rather than crafting a new bespoke object through which the interaction could take place (as with the *RememberMe* project – Speed 2010), or using an existing device such as a mobile phone (as with *A Conversation Between Trees* – Jacobs et al. 2013) or computer (as with the *Seeds to Soil* project – Tran 2011), I felt there was potential for taking an everyday object that is used at the farm and turning it into an interactive device, as a way to afford it unexpected qualities and create surprise and curiosity. The Talking Quilt project used an oven glove that was embedded with an RFID (radio frequency identification) reader that triggered sounds when it passed over RFID tags that were hidden inside the quilt. Interacting with the quilt through the glove worked well because it was an everyday object in which the electronics were hidden, and therefore it was not intimidating to an audience that was not very tech-savvy, as it did not rely on any prior technical knowledge or ownership of specific devices. It had proved to be an intuitive and accessible interaction of the type that would be appropriate for the farm, where, for example, relying on mobile phone technology would be exclusionary (as identified in the exploratory study, Chapter 4). It was also humorous, and it retained its qualities as a visual, tactile and everyday object regardless of the technology.

In a similar vein, with the Talking Plants project I decided to hide the electronics inside an everyday farming object, a watering can, and to program the system so that sound began to play when the spout touched a plant label. This had two purposes. The first was to make the project as accessible and inclusive as possible to a diverse audience who were potentially intimidated by new technology, thereby supporting the core value of community as conceptualised through the themes of inclusivity and diversity (described in Chapter 4), and, second, to make it playful and fun to use for all ages.

I used a common six-litre green plastic watering can. I designed it to create a sense of magic for users when plants' voices emerged unexpectedly from this simple and humdrum object. The watering can was the perfect vessel within which to hide all the electronic components including speakers. It was lightweight and just the right size. It was an object that everybody knows how to use. The gesture of approaching the soil with the spout of the watering can in order to trigger the sound to play is intuitive and familiar. Some people queried why the sound came from the watering can and not the plant, and while this was something I considered, it was a technical restraint that I did not have a solution for.

In order to heighten the playfulness and provoke surprise and curiosity, I decide to have the plants talk in first-person voices and address the listener directly.

Electronics

Inside the watering can is an Arduino Uno microcontroller with an Adafruit Waveshield on top for audio playback. Connected to the Arduino is an ID-12 RFID reader, which is housed in the watering can spout. The audio out of the Waveshield is connected to a small speaker. The Arduino, Waveshield and RFID reader are powered by four AA batteries.

RFID tags are attached to plant labels that are lodged inside the plants' pots. When the RFID reader identifies one of the unique RFID tags it plays back the

specific audio track associated with that tag. The sketch is programmed to play a track once and not repeat it until another track is played first. It is also programmed to stop playing when another tag is read. There is no way to stop a track playing other than by starting a new one playing.

I drilled holes in the sides of the watering can for the sound to come out.

The system was designed to be robust and inexpensive (costing around £70). It was designed to be used by people of all ages, including children. It has no trailing wires and no visible electronic components.



Figure 34: Detail of the watering can spout with ID-12 RFID reader inside



Figure 35: Close-up of plants with black RFID tags



Figure 36: Close-up of augmented watering can

Content

Mandy and Olivia decided on six herbs that we would make talk. These were: lovage, wild garlic, bronze fennel, comfrey, chicory and feverfew.

Mandy and I researched these plants with a particular focus on their medicinal qualities and how to grow and prepare them, as we were presenting them at the Fascination of Plants festival and this focus was of particular interest to Mandy. I then wrote scripts based on this research, in which the plants talk in first person. I gave the plants each an individual character and tried to make the content conversational and fun. The plants address the listener directly. Some of them try to convince the listener of their superior qualities and that they should take them home and look after them.

Mandy and Olivia confirmed my beliefs that the quickest and easiest way to find volunteers to perform the scripts would be simply to go to the farm and ask people directly (rather than use email, for example). Mandy and Olivia helped me find volunteers by suggesting people I could approach. I set up my recording studio in a polytunnel and found six volunteers to record as they read the scripts. They were all regular volunteers, who worked in either the gardens or the farmyard. The voices come from three men and three women, of varying age, from early twenties to late seventies. Accents include Caribbean, Dutch, German and English (including one Cockney accent), reflecting the cultural diversity of the farm.

I subsequently edited the audio clips into tracks of 30–60 seconds, one for each plant.

[Scripts are in the Appendix.]

Phase 4: First evaluation

The first evaluation took place at the Fascination of Plants Festival on 20th May 2013. Together with Mandy and Olivia we decided that the focus of this public demonstration of the Talking Plants would be herbs and their medicinal qualities. The Fascination of Plants was a well-attended public event at the farm, with food stalls, farm tours, donkey rides and a demonstration of interesting plant chemistry. It was held on a sunny and warm Sunday in May. Near the centre of the farm, myself and a research assistant, Sophie, set up a table covered with a colourful tablecloth. On the table we arranged twelve different herbs for sale with five of each type in a row. Six of the twelve types of plant were augmented with RFID. In the first row was a pot of each of the augmented plant types with a wooden label with a black RFID tag attached. The watering can sat in the middle of the table. A sign declared that this was a Talking Plant Sale, and the plants cost £2.50 each.

This evaluation was conducted to investigate people's experiences of interacting with the Talking Plants experience and for this reason I chose to

conduct semi-structured interviews with users, and to observe and make notes about their interactions.

Data collection

Sophie and I occupied the stall for five hours. We made detailed written observations of people interacting with the system. We observed 36 people interacting with it, including 25 adults and 11 children. Ages ranged from infant to 60+, and people came from a variety of social and ethnic backgrounds. Professions included retired pharmaceutical engineer, secondary school teacher, scientist, and photography student. We conducted semi-structured interviews with nine of the users. Interviews lasted between two and nine minutes. Questions we asked included: *Why did you come here today? How would you describe your experience? What did you like/dislike? What did you learn? Did it change your relationship to the plants? Did it make you think about them in a new way? How did you feel about using the watering can to communicate with plants? What would plants say if they could talk? What would you like to hear them talk about?*

I discuss findings from a thematic analysis of these data in the “Findings” section below.

Phase 5: Iteration

The design went through an iterative design process over the summer (including a second public demonstration at the farm at an “eco-chic” Sunday market) before culminating in a final presentation and evaluation at the Festival of Heat at the end of September 2013. The iterative design was based on feedback from the evaluations, and from discussions with staff and volunteers, particularly from a meeting with Olivia and Mandy on 6th June 2013. This meeting was recorded and lasted 40 minutes. It is included in the data set analysed and presented in the findings below.

Evaluation at eco-chic market

On 11th August 2013 I demonstrated the Talking Plants for a second time at an eco-chic market at the farm. The purpose of this evaluation was to collect more data about people's experiences of the Talking Plants. I also wanted to see if people would use QR codes in addition to the augmented watering can. The *RememberMe* project (Speed 2010) described in the "Related work" section above employed both RFID and QR codes, which allowed for people to use their own mobile phones to access the content, or to use a dedicated device made available to shoppers/visitors. I wondered whether the QR codes were a viable option to make content available at the farm, although based on my findings from the exploratory study (as described in Chapter 4) I suspected that they were not. In order to test this, each augmented plant had a QR code attached to it, which linked to a webpage that would play the same audio track as the watering can.

The eco-chic market was held every Sunday during the summer. Stallholders sold food produce as well as handicrafts, and these were usually festive, well-attended events. It was also an opportunity for the farm to sell some of their produce including vegetables, eggs, goat milk soap, other handmade goods and knick-knacks, and plants.

I set up the augmented plants alongside the other plants that were for sale at a large counter. Tess, one of the regular gardening volunteers, was working at the farm stall selling their produce. This event was not as well attended as the first evaluation, and our position was a little out of the way of the general traffic.

I was selling the original herbs with medicinal qualities from the first showing (lovage, wild garlic, fennel, comfrey, chicory and feverfew). Wild garlic was no longer in season, so I included a picture of wild garlic on a stick in a pot, with a label attached.

For this evaluation I presented the same plants and audio content as previously.

I made observations of users (this time without a research assistant) and recorded semi-structured interviews with six of them. I observed 35 people interacting with the system including 29 adults and six children under 16. Ages ranged from infants to 80+. Findings from these interviews and observations are included in the analysis below.

Planning the final evaluation

Together with Mandy and Olivia we decided that the final presentation for the summer would be at the Festival of Heat (chilli festival) on 29th September 2013.

For this event we decided to focus on presenting augmented chilli plants. Chillies were being grown in abundance at the farm throughout the summer and by August the polytunnels were full of them. Some of these chillies had been grown by staff and volunteers, while others had been donated to the farm. They would be presented and sold at the Festival of Heat.

In a meeting with Olivia and Mandy we discussed how the content for the chillies should include growing conditions, folklore and stories, and botanical information, as well as the personal stories of the people who had grown them and their stories of migration from other lands.

Mandy and Olivia helped develop the project in terms of thinking through what content would be good to incorporate, and what value the project could add to the farm and also the wider public wishing to learn more about growing edible plants.

Olivia said that the kind of content should include

how to look after plants. Some of the plants we have are quite unusual or hopefully are going to be unusual. I think that would be quite interesting to look at because a lot of people come and ask about how

do you grow a kudu, and the specific things attached to that. That would be really useful because that's just a way of labelling in a sense.

Although at this early stage we were planning to demonstrate the Talking Plants at public events at the farm, we also discussed the future potential of leaving the system permanently at the farm to help with day-to-day plant sales. Olivia reflected

that's actually useful for us because we haven't got people around all the time and ... we're not all plant experts. I don't know the conditions for lovage. I don't retain all that information at all so Although it'd be lovely to have someone out here all the time, that's just not feasible from a community project perspective. So it is really helpful.

Mandy and Olivia also helped work through logistics of demonstrating the project in terms of positioning of the display and which plants to include.

Refining the design

In examining the data from the first two evaluations, as well as from conversations with staff and volunteers, I made a number of changes to the project – both in content and interaction – before presenting it at the Festival of Heat.

First of all, I decided to break up the audio clips into smaller sections. In this way, each plant had a number of tracks associated with it. The first time you touched the tag you would hear the first installment. If you touched it again you would hear the second installment, and so on. Each plant had between four and eight installments. Installments lasted from 4 to 56 seconds. This refinement was in response to suggestions that there was little flexibility with the original design: you couldn't turn it off, and you couldn't hear more even if you wanted to. There were suggestions for different kinds of content such as medicinal, growing, recipes, botanical and historical, etc. The new design would be a way to access this additional content if you wanted to, in installments.

The second refinement was that we decided to incorporate more and different kinds of content. In September 2013 I spent time at the farm recording people's personal stories about chillies. Some of these were general stories about chillies, while others were stories about specific plants at the farm. For example, I collected stories about chilli plants that had been donated from various sources, their lineage (e.g., if grown from seed, where the seeds had come from), and how to look after them. I then rewrote these stories as scripts, once again told in first person and addressing the listener directly. One prize-winning chilli spoke of how its ancestors travelled from Bangladesh to Spitalfields in London, then to Dorset in the UK and back to London. This mirrors the migration patterns of the people who tended to it. Other content included how to grow and prepare the plants, and their medicinal qualities.

There were two stages of recruitment: the first to collect stories, and the second to record the scripts based on those stories. I approached and asked people directly if they would like to help contribute to the project, sensitive to fitting into the natural rhythms of people as they went about their jobs. Many times if I requested help from someone they said that they would come as soon as they had a break or finished what they were currently doing. I recorded stories from Lutfun, a staff member who ran the Coriander Club gardening group for the Bangladeshi community and was known as the chilli queen; from Evelyn, a long-term gardening volunteer who grew chillies and donated them to the farm; and from two other staff members who had given each other chillies as gifts.

I had some doubts about whether I should present these audio tracks as they were told in their original version and voice, or rewrite them as scripts with the chillies talking in first person. In the end I decided to go with the latter idea as I felt this would be more playful, fun and engaging. It also allowed me to present the herbs from the previous demonstrations and have some cohesion with the content.

I wrote scripts for five chilli plants. Some of these scripts were for specific kinds of chillies, one was for a specific specimen (it was a large, prize-winning chilli), and others were for more generic chillies.

Once I had written the scripts I once again set up a recording studio in a polytunnel and approached people to ask them to read out the scripts. Volunteers included two staff and three volunteers, with four female voices, and one male. Ages ranged from twenties to forties.

Phase 6: Final evaluation

The final evaluation was conducted at the Festival of Heat on Sunday 29th September 2013. The purpose of the evaluation was to collect additional data about people's experiences with the Talking Plants. A large number of people were expected to attend. For this reason the evaluation included a questionnaire as a way to capture a larger data set. I also asked additional questions that I had not asked in the previous evaluations, about ease of use of the system, people's prior experiences with technology, and how they thought the project related to sustainability. I discuss the questionnaire in greater detail below.

Given how busy it was going to be, I decided to video-record the interactions in order to supplement my observations by reviewing them later. However, I did not intend to conduct an in-depth analysis of these data.

The chilli festival had vendors from all around the UK selling their chilli products of all kinds including condiments, chocolate and beer. There was live music all day. A number of stalls were serving hot food. The festival was attended by over 3500 visitors.

I set up a table with the augmented plants, which included five chilli plants and five medicinal herbs – one of each different variety. The large chilli plants were displayed prominently at the front of the table, the herbs to the side. Each plant had a wooden label with a black RFID tag stuck on it, as well as a label with a QR code. As with the second evaluation, the QR codes linked to

webpages that played the associated audio content. This was to test whether my assumptions that the QR codes would not be commonly used were right. In contrast to the other two evaluations, this time the plants were not for sale (although there were plants for sale elsewhere at the farm).

Myself and two research assistants demonstrated the Talking Plants for six hours at the festival. We made detailed observations on people's interactions including how many plants they listened to, whether they listened to more than one installment, and whether they accessed the QR codes. We collected 27 questionnaires. In addition I conducted open-ended interviews with 20 users. The audio interviews were transcribed.

The questionnaire inquired into people's previous experience with interactive technologies. It used a five-point Likert-type scale to understand people's experience of interacting with the system. Respondents were asked to rate:

- i) how they enjoyed the experience
- ii) how easy they found it to use
- iii) whether they would recommend it to others and
- iv) whether they found the content interesting.

Respondents were then asked to describe in their own words:

- i) how they thought the project related to sustainability
- ii) if they could recall any facts or information they had learnt
- iii) what they liked best and
- iv) what they liked least.



Figure 37: Display of Talking Plants at the Festival of Heat



Figure 38: User listening to the Talking Plants at the Festival of Heat

Data analysis

The findings in the next section are the results of a thematic analysis of a data set that includes the following:

- Transcripts of audio recordings of two meetings with Mandy and Olivia
- Transcripts of audio recordings of 17 semi-structured interviews with users of the Talking Plants at the three public evaluations
- Observational data logged at the three evaluations of user interactions
- Questionnaires from 29 respondents
- My field notes as written up in my blog from visits, conversations, meetings, observations and reflections from the period as described in the “Phases of activity” section above.

In addition, I also collected 170 minutes of video recordings of people interacting with the Talking Plants. I conducted an informal review of the video data and used it to supplement my observations and audio interviews, which are the primary source of data.

I applied a deductive thematic analysis (Braun & Clarke 2006) (see Chapter 3 for a detailed discussion of thematic analysis) to the data set, coding the textual materials into initial codes, according to the steps described in detail in Chapter 3. I chose a thematic analysis for its theoretical freedom, for its flexibility and potential to “*provide a rich and detailed, yet complex, account of data*” (ibid.).

The deductive, or theoretical, approach to the data means that the codes are generated by examining the data with specific questions or interests in mind. In analysing the data I was interested in exploring the following questions:

- How do people experience and interact with the Talking Plants installation?
- How do they interpret it and make meaning from it?
- How does it support and add value to the farm?

- How does it contribute to understandings of sustainability?
- What worked and what didn't work about the community-based Participatory Design methodology, including tensions and challenges that arose?

The results of the thematic analysis are presented in the "Findings" section below.

Although I conducted a deductive process of coding the data, I also coded parts of the data for things that I was not looking for if they seemed interesting, surprising or potentially relevant.

I acknowledge the active role I brought to this process, making choices according to my research interests and my experiences as a socially engaged artist, and grouping them in a way that made sense to me.

The results of the thematic analysis are presented in the "Findings" section below, and presented under the thematic headings and subheadings as organised by the thematic map generated through the analysis.

Findings

In this section I describe the findings from the thematic analysis of the data set described above. These have been organised into the following themes and sub-themes that have come from the thematic analysis:

Experiencing the Talking Plants	<i>Experiencing the ludic through humour and fun</i> <i>Multisensory engagement</i>
Broadening perspectives on sustainability	<i>Shifting the frame from consumption to production</i> <i>Care</i> <i>Bringing hidden things into view</i>
Giving value to the farm	<i>Opportunities for learning</i> <i>Supporting the community through accessibility and inclusivity</i> <i>Community engagement</i> <i>Financial sustainability</i>
Participation	<i>Configuring participation through engagement and interaction</i> <i>Maintaining control</i> <i>Being embedded as a resource</i>

Table 4: Themes from thematic analysis of data

Experiencing the Talking Plants

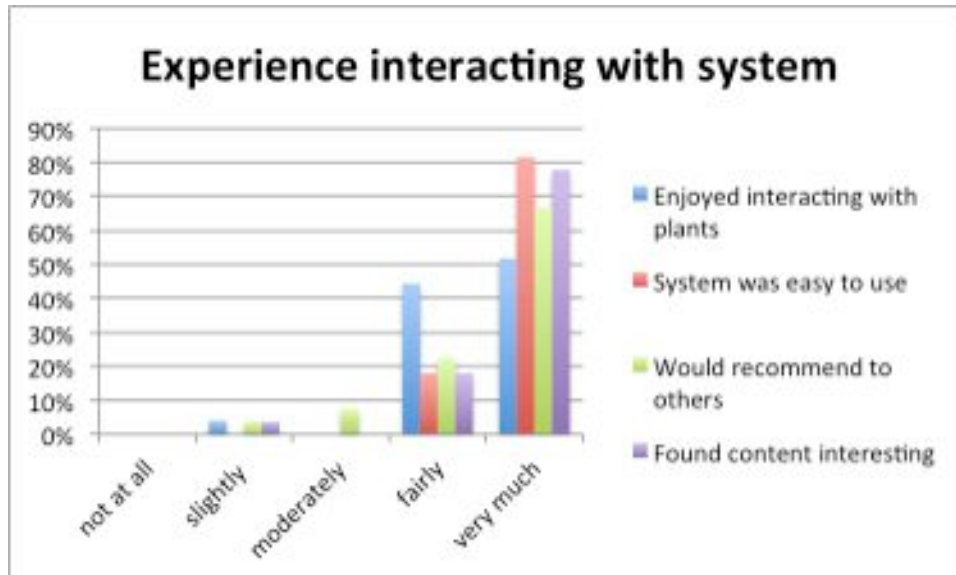


Figure 39: Responses to questions about their experience of the Talking Plants system

On the whole, users found the experience of the Talking Plants to be enjoyable, interesting and easy to use. Of the 27 questionnaire respondents, 26 enjoyed interacting with the watering can very much or fairly; 27 found it very or fairly easy to use; 24 would be very or fairly likely to recommend it to others; and 26 found what the plants to be saying to be very or fairly interesting (Figure 39).

Words used to describe the project included (instances given in brackets): *clever (5), novel (2), unexpected, innovative (2), fun (6), unique (2), inventive, new, different (5), sweet (2), amusing (2), entertaining (2), informative (2), simple (2), brilliant (3), strange, funny (2), wonderful (3), original, enticing, intuitive, lovely (2), amazing (2), imaginative, immediate, beautiful, quirky.*

One user commented, "*This is a new experience for me. I just like every minute of it*" (P4). Overall people appeared to derive a lot of enjoyment and pleasure from interacting with it. It seemed to delight both young and old.

Many people were observed to be laughing, smiling, and talking to others while interacting with the system.

Experiencing the ludic through humour and fun

The ludic elements came through the interaction with the watering can, as well as through the content, in which the plants appeared to be talking to you. One user commented, *“I think it's really really good. It's really really clever. You spend much longer thinking about each of the plants than before. It kind of gives them each a lot of character which is very sweet”* (P4). Another commented that the content (in the first two evaluations) might be a bit long for children. *“But for adults it was fun. I enjoyed that”* (P11). Another user referred to the aesthetic pleasure of hearing the plants talk in different voices: *“I can see the logic, I can see the beauty of having different voices for different plants”* (P1). One user commented, *“The lady [Lovage] was really funny, saying it's an aphrodisiac and can stop smelly armpits. That was really funny”* (P17).

One user, a retired pharmaceutical engineer from GlaxoSmithKline, pulled up a chair to sit on, and listened to all the plants' voices one after the other systematically. He commented: *“It's very well done. A good wheeze. A good plan”* (P9). Afterwards, he stayed seated and wanted to engage with me in conversation for about half an hour. I was surprised that someone with such a traditional pharmaceutical background would be so interested in a playful way of dealing with old, unscientific, plant knowledge. But he was very interested in and excited by the project, to such an extent that he brought his wife and grandson to come and listen.



Figure 40: Retired pharmaceutical engineer listening to all the plants

I acknowledge that interviewees and questionnaire respondents may have been influenced by the knowledge that the person asking them to evaluate the project was the same person that designed it. I tried to be aware of this bias and to find ways to prompt users to respond to questions without increasing this bias (Rogers et al. 2011).

Multisensory engagement

Observations of users interacting with the Talking Plants, as well as the video footage from the Festival of Heat, show that the system encourages a multisensory engagement, incorporating the visual, the audio and the tactile. Many users fondled the plants as they listened to the audio. They also looked intently at the plants, their gaze moving slowly up and down. One user referred to the visual and audio/listening aspects of the project:

It's one thing if people came along to see plants, or just look at them, and that's nice in itself, but to actually be able to use that. You can just see people would love just to do that, that thing, and to hear the story. And actually, like me would probably stand and listen. (P5)

This differs from many of the other projects discussed in the “Related work” section above in that it offers a sensual experience with living things. By avoiding the use of screen- and text-based systems, the Talking Plants project provides opportunities for people to be more fully engaged with the plants, and with each other. The video-recording from the Festival of Heat (third public demonstration) shows four instances of people using their mobile phones to access the content on the QR codes, and spending a great deal of time hunched over the screens, trying to get them to work. They do not look at the plants. This is in strong contrast to footage of those using the watering can, where their gaze is typically directed toward the plants, or back and forth between the plants and the people they have come with.



Figures 41 and 42: Stills from video showing users looking at the plants and at each other

Interaction with the Talking Plants also differs from the *RememberMe* project (Speed 2010), where, again, you have images of people engaged with a device rather than the object that the content is about. Observations of the Talking Plants suggest that sound offers an escape from this trap and provides the possibility of a more multisensory and social experience.

Broadening perspectives on sustainability

Through its playful and open-ended nature, with no prescribed right or wrong meaning to be made from it, the Talking Plants project allowed for multiple interpretations and new perspectives on sustainability. This includes *shifting the frame from consumption to production, care, bringing hidden things into view*.

Shifting the frame from consumption to production

The Talking Plants project offered people the opportunity to consider their existing and potential role as producers of food, rather than just consumers, and in this way answers the call of DiSalvo et al. (2009) to provide a space within sustainable HCI to engage with questions of how we understand society, “*and our role in it as consumers and makers of things*”, and to consider alternative discourses of sustainability beyond the dominant one of sustainable consumption (Hobson 2002; Knowles et al. 2013; Dourish 2010). When asked in questionnaires how the project related to sustainability, six of the respondents commented on the connection between sustainability and encouraging, educating, and increasing desire to grow their own food. For example, the project “*Helps encourage people to grow their own food*”; “*Encourages people to think about growing their own plants*”; “*It encourages you to grow your own chillies*”; “*makes me want to plant chillies more*”.

Rather than framing themselves solely as consumers of food, the Talking Plants provided opportunities for those interacting with the system to consider producing their own food, and hinted at the sense of empowerment of doing this for yourself without relying on shop-bought products. “*When you hear what the plant does, and you're thinking, well why don't I grow some myself? And then if I get bad breath, or whatever it is, then the plant is there*” (P5). Another person commented, “*didn't know you could boil [feverfew] and cool it, I guess these things you could do for yourself*” (P7).

This sense of potential empowerment that arises from doing things for yourself is echoed in the experience of self-sufficiency described by one of the long-time volunteers (who donated a story to the project as well as providing her voice for the character of Lovage). The experience of interacting with the Talking Plants prompted her to think about the role of plants in the West Indies, where she grew up, and the lack of reliance on shop-bought produce.

All of the teas that we drink was made from plants, we just go and picked the herb. We didn't really go to the shops and buy things like coffee and tea. You know, we were self-sufficient when it comes to those things. Plus, for every ailment back home in my country, there's always a plant. Even giving birth, for a women to take, giving birth there was always a plant. A plant for everything. A plant for ringworm You get cut ... you just ... pick the leaves and rub it between your fingers. That's part of how I've grown up, and it stays with me. (P4)

From these comments we get a sense of the ways in which people's lived experiences, practices of consumption and production, knowledge, self-sufficiency, health and well-being are interrelated. They demonstrate a stark contrast to the framing of sustainability within HCI as a problem to be solved by rationalising and optimising individual consumer behaviour through the use of technologically driven and expert-led solutions. These comments indicate that the Talking Plants, and the ways in which people relate to the theme of sustainability from interacting with it, fit more with a sustainable society discourse, rather than the discourse of sustainable consumption that is typical within HCI:

Rather than linking up efficiency, science and the consumer through voluntary market mechanisms, as the rationalisation approach does, sustainable society discourses link up the moral citizen and personal experience with networked communities that range from global to local, through varied forms of overt and discrete social action Sustainable living is no longer just about consuming products but about how social

and environmental resources of common good(s), spaces, networks, futures and relationships need to foster respect for each other and, in turn, for the environment. In this sense, the environment is not (just) about 'nature', but about the total environment of lived spaces and daily experiences, the urban experience that is part of modern environmental histories. (Hobson 2002)

Care

Many of the responses to the Talking Plants highlight the ways that the project brings to light the centrality of care in the relationship between people and plants. These findings reinforce the findings on the ways in which sustainability is constituted through the notion of care, as discussed in the exploratory study (Chapter 4). Growing food requires an investment of time and energy, a consideration of other living things. The project brings this aspect of growing to the fore in two ways: by retelling the stories of those who grew the plants and the love and care that went into nurturing them, and by informing listeners how to continue looking after them.

In planning the project, Mandy said of the plants at the farm, *"they might not have such a fascinating history to them, but a lot of people have been involved in taking care of them here"* (Mandy, meeting).

One user explained what she thought plants would say if they could talk: *"You can talk about the maintenance of the plant. ... Take care of me and I will take care of you. That's the ongoing growing thing They'd be saying take care of me, don't neglect me"* (P10). Another user reflected on how caring for and connecting with plants contributed to well-being:

I think it gives you a few extra years on your life really, I think it's ... people that don't have the opportunity to create if you like. It's a sad thing. You feel that you're part of something, you've shared in the growing experience of whatever plant survived. (P2)

This echoes Gaver's explanations from *Designing for Homo Ludens* (Gaver 2002):

The examples described here may be pleasurable to experience, but it should be clear that they go beyond mere entertainment They raise these issues, but don't provide answers. Instead, they offer ways for people to experience life from new perspectives, thereby testing hypotheses about who we might be or what we might care about. They hint at possibilities for technologies that we could use in our everyday life, not to accomplish well-defined tasks, but to expand in undefined directions.

People's ludic encounters with the Talking Plants seem to open up new perspectives on what we might care about. They also encourage people to play with new ideas and experiences.

Bringing hidden things into view

Users of the system commented on how the humorous and unusual interaction with plants that talked to them allowed them to see these living things, which they normally did not think about, in new ways. The project highlights the overlooked, the mundane – the things we wouldn't normally consider. *"They're telling me about themselves and that made me want to get to know them more"* (P9).

Responding to the question of how the project relates to sustainability, questionnaire respondents' answers include: *"Giving plants a point of view and raises awareness of usefulness of plants"*; *"Gives you an appreciation of the plants and their uses"*; *"Creating interest in our planet's living things"*; *"It creates interest in plants in a unique way"*; *"it gives the plants a human aspect we can relate to"*.

By asking users to consider the living things that they would normally overlook, the project seems to foster a greater connection between the user and these other living things.

I like the fact that they're introducing themselves because it takes it to another level. "Hello my name's Comfrey". That's lovely. It sort of involves me in with the plants. And Comfrey says, "and this is how you use me I'm happy to be of service to you. Just pinch my leaves off and I'll do my best to help you. And you can help me by occasionally watering me when you see one of my leaves going a bit brown". (P10)

The ludic encounter with the humorous voices of the plants employed in the Talking Plants downplays the authority of the system, which means that users can react to it with a level of scepticism, and appropriate it as they wish.

I like the idea that I'm coming to this pot, this plant, and I'm getting information from this plant It's clear for me that it's a person recording this. It's great, the idea that you are getting information from the plant that I'm looking at ... I think what you created is a great idea and I'm not necessarily convinced to say that the plant is talking to me, but your idea is talking to me. (P1)

The ludic encounter "frees users to react to designs with scepticism or belief, appropriating systems into their own lives through their interpretations" (Gaver et al. 2003). The pleasure described by the above user's comments may arise from the ambiguous situation, whose meaning-making is personal and belonging to each individual. This process "can be both inherently pleasurable and lead to a deep conceptual appropriation of the artefact" (ibid.). The ambiguity of the user's relationship with the system encourages self-reflection into "how we might personally use such products, and what our lives would be like in consequence." (ibid.). Indeed, the same user (P1) started to imagine how he could use the Talking Plants system at home.

I think it's a brilliant idea to just ... you go around with your ... maybe let's think this could be an iPhone, and you've got these labels, these round things, and could not be necessarily plants, and you just get information from the object itself It's something that I would

potentially... like to use it in other situations... for instance I'm pretty sure that I would like to have these tags, I don't have too many plants in my house, probably no more than four or five pots, but I like to have these tags at home I get my iPhone and it's telling me about ...
(P1).

By bringing hidden things to life the Talking Plants seem to foster a sense of empathy and identification, and increase appreciation. This becomes clear when users were asked to consider what they thought the plants would say.

I think they'd say, leave me alone, I'm a plant. Go away. But, equally, plants should be happy just to have a voice to be able to say look at all the good things I can actually do for you. Do you realise what we plants do for you? (P5)

If they really could talk, [they'd say] "I'm hot. Get me under cover. Give me a drink". (P9)

[Plants] might be as alive as animals. So be considerate with them, and not abuse so much of them. Respect more the environment ... without exploiting it too much. (P6)

In describing the Dawn Chorus, Sengers et al. (Sengers et al. 2005) write: “*The value of human dominance over animals is embodied in a personal, living music box. The extremity of this design provokes reflection on our existing practices of domination over nature and the role of technology in this drive*”. The Talking Plants project draws similarities: through the ludic encounter, users were provoked into reflection about the ways that humans dominate over nature.

A questionnaire respondent, in answering how they thought the project related to sustainability, wrote that it raises awareness and generates interest in plants and “*our planet's living things*”.

Giving value to the farm

Findings from the analysis of the data set indicate that the Talking Plants project directly supports the values of the farm, and gives value to the work that it does. This contribution to the farm's work can be divided into the following sub-themes: *Opportunities for learning*; *Community engagement*; and *Financial sustainability*.

Opportunities for learning

The Talking Plants project contributes to the value of education at the farm, by providing an effective way to for users to learn about how to grow and prepare plants, as well as their medicinal and health properties. Of the 27 questionnaire respondents at the Festival of Heat, 25 could recall a fact or story about the specific plants they had interacted with through the project. At all three evaluations there were numerous examples where interviewees cited specific examples of new learning: *"I know feverfew but I only know it as a tincture. I didn't know you could boil it and cool it, I guess these things you could do for yourself"* (P7). Another recalled, *"It's wild garlic. It's more potent and good for you than regular garlic – that's basically what I picked up. It's very good for high blood pressure"* (P2). *"I remember one that's supposed to pep up my night time skills"* (P9).

While many cited concrete examples of new learning, others commented on the potential of the system to support learning about plants: *"I think it's a really good way to teach people things"* (P5); *"It's an interesting way of bringing the knowledge to the fore"* (P9); *"It's such a great and informative way to find out about things. Instead of waiting for someone to go 'excuse me what does this do?' or 'where do I plant it, how do I ...?' If it's all there, you just touch it"* (P10).

One user thought it was an especially effective way of supporting plant identification: *"I just think what a great way of identifying plants and understanding what they do. Oh so that's comfrey, this is what a comfrey"*

plant looks like" (P10). This supports Olivia's comments that the Talking Plants project was a form of verbal labelling.

One interviewee felt that the system encouraged thinking about plants more. The playfulness of it enhanced the experience, supporting the learning process and making it more enjoyable:

I think it's really really good. It's really really clever. You spend much longer thinking about each of the plants than before. It kind of gives them each a lot of character, which is very sweet. I really liked the lovage where they really take on a persona. It becomes a kind of characterful education. (P12)

Finally, many interviewees thought that the system would be a particularly engaging way for children to learn about plants: "*What a great way for kids to learn as well. As an adult I'm totally captivated so God knows what it's going to do to kids. I think it'll blow their little minds*" (P10); "*I would imagine for some young child ... that they would get so excited in what's happening and of course it's going to lead on ...*" (P14); "*It's marvellous. I think for slightly older children they would find it even more fascinating*" (P2); "*And it would educate the kids! To find out what is it, and hear a story and do it in a different way*" (P8). The observations confirmed this: children of different ages were observed interacting with the system, spending extended amounts of time listening to the different voices, sometimes jostling for a turn. However, I did not interview any children on their experiences, as I did not have the required ethical approval, so I cannot confirm whether it aided their learning experience or not. One mother spoke of her young son's experience: "*It encouraged my son to inquire, but I thought it was a bit long for him to keep his attention*" (P11). This was with the initial design, where the tracks were about one minute each, and not the later version in which the track length was reduced.



Figure 43: Young person listening to the augmented watering can



Figure 44: Very young person listening to the watering can

These findings suggest that the Talking Plants project supports the value of learning and education that is core to the farm. By supporting the educational programme, information sharing and community outreach of the farm, it may provide a more effective way of protecting the environment than designing mobile phone apps for individual consumer behaviour change (Baumer & Silberman 2011).

Supporting the community through accessibility and inclusivity

Analysis of the data indicates that the Talking Plants project is a very simple, intuitive, robust and easy-to-use system that does not rely on any prior technological expertise or ownership of device, as detailed in the rest of this section. By allowing for diverse audiences to participate (including those with visual impairments) it contributes to the core value of community at the farm, as articulated in Chapter 4.

Questionnaire respondents were asked to answer on a five-point scale how easy they found the watering can system to use. Of 27 questionnaire respondents, 22 found it very easy to use (a score of 5) while the remaining five respondents found it fairly easy to use (a score of 4). Children as young as three were observed to be able to use it without any problems.

Interviewees commented on the ease and simplicity of the system: “*You can see the plant and you know exactly which plant they’re talking about*” (P4); “*All very clever. All very intuitive*” (P9); “*It’s very simple*” (P7).

The technology was hidden inside the watering can, and the interaction was very simple and intuitive. After a brief verbal invitation by myself or a research assistant to touch the spout to the black dot, each user succeeded in triggering the interaction on their first attempt. By hiding the technological components inside the everyday object of the watering can, the technology was non-threatening to those who had little experience of using interactive devices. One user commented that the lack of cables and wires was their favourite aspect of the system.

It is interesting to note that, in comparison, the QR codes which were attached to the plants in the second and third evaluations were not accessed at all in the second, and in the third evaluation only 7 out of 117 users accessed the QR codes on their mobile phones. As one user explained *“It’s lovely, it’s so simple, you just pick [the watering can] up, go towards a plant and it’s done ... but with a phone [and QR code] ... I wouldn’t know what to do, you’d have to show me”* (P10).



Figure 45: Detail with QR codes

Users reflected that the Talking Plants provided an effective and enjoyable alternative to printed information:

It's the kind of thing similar to what you'd find in museums or heritage sites where you've got an audio guide and you kind of walk about at your own pace and then find the information without having cumbersome labels that you can't read. So something that you can enjoy, listen to while you're doing something else. (P8)

It's imparting knowledge in a really good way. You're not having to go through a book and look something up. (P10)

Others thought that it would be useful for people who did not speak English as a first language and may be too shy, or too lazy to ask of a person: *"I might want to know something about this plant, but maybe I'm a bit lazy to ask. Having this possibility in place wins my laziness"* (P1). Users also commented that the system would be particularly useful for people with visual impairments.

You could get bored with reading, even, if the font is too small, haven't got your glasses with you, so you walk off. But the little button is marvellous, to the point that I got a chair to listen to them. (P9)

These comments suggest that the project can contribute to the values of diversity and inclusivity of the farm, by providing for those of diverse ability, age and language, without the need for prior technical experience or ownership of mobile phones, and in this way it allows for people of all ages and abilities to participate, contributing to the value of community as articulated in Chapter 4.

One question that may arise is why the community was open to this kind of technological augmentation, but not the direct augmentation of gardening practices as discussed in Chapter 4, the exploratory study. The answer may lie in the way that it leveraged existing practices (namely, watering, caring for and learning about plants) and objects (watering cans and plants) rather than introducing new devices, such as mobile phones. This echoes the move in

reflective design “*away from designing new experiences to augmenting existing experiences in new ways*” (Sengers et al. 2005).

Community engagement

The farm is often cited as hidden, off the beaten path, an oasis in the city that nobody knows about. One of the main challenges of the farm as described in the Exploratory chapter (Chapter 4) is how to bring in new audiences and widen exposure. The farm is constantly seeking new ways to bring in visitors and volunteers, who in turn help contribute to its financial sustainability through donations and sales, as well as to its social and environmental sustainability through the increase of volunteer labour, gift exchange and participation in the community.

The Talking Plants project contributes to community engagement by broadening exposure to the farm and drawing new audiences and visitors. One very concrete example is that of a user who came to the farm for the first time to experience the Talking Plants after seeing a notice in the London magazine *Time Out* (P17).

Community engagement and helping to bring people to the farm to learn about plants and the environment was cited as a motivation for volunteers to get involved in different activities at the farm. Evelyn is a long-term volunteer, who donates plants to the farm. She also contributed her voice to the talking plant Lovage. After she experienced the Talking Plants, I asked her why she donates plants. She answered: “*I’m just playing my part. I’m helping here. This is a community place, and I’m helping so that people can come and see and learn more about plants and the environment*” (P4).

Another user reflected on how the Talking Plants could contribute to the community engagement focus of community gardens.

I think the idea is brilliant, and I know of a garden where I kind of work, where they might be interested in using this kind of technology, because it's all about community engagement, and getting the public,

who might be visiting the garden just once in summer, because they have open days to the general public and then membership to get into the garden on a regular basis. So, having something like this would be fun for the people who are there on the day, and it would educate the kids, to find out what is it, and hear a story and do it in a different way.
(P8)

The playfulness of the interaction, the surprise elements and the fun were cited by users as attention catching, enticing and engaging for new audiences, providing an entry point into the world of food growing for people who may not otherwise inquire:

The most amazing thing about the talking plant display here is that it involves people, and one of the best things about involving people into gardens, it becomes part of them, they get a passion for it, it educates them and inspires them. I think these Talking Plants are ... a wonderful introduction into the world of planting. (P15)

It catches attention. And maybe it's a good option for people to approach. (P6)

It encouraged my son to inquire. (P11)

Part of the design rationale of the Talking Plants was to be careful not to compromise the social interaction that is integral to the community engagement aspects of the farm. Analysis of the video data suggests that, as intended, the project did not compromise social interaction; rather, it appeared to encourage conversations between users. With the great majority of interactions where users experienced the project in pairs or small groups, they talked to each other, pointed to the plants, made eye contact and smiled. One user suggested that it starts conversations that would not otherwise occur: *"I don't think we would have asked this lady, can you tell us the medicinal qualities of lovage, so it starts that conversation that wouldn't normally even happen"* (P13). Indeed, the video documentation shows many occasions

where the interactions prompted users to start a conversation with myself or one of the research assistants.

One user felt that the technology forms an initial barrier but that having a person behind it encourages deeper conversation: *“Here it's forming the first barrier, a breakdown of conversation. But when you've got someone like yourself behind it's an excellent medium to interact and get into deeper discussion”* (P14).

Using sound rather than screen-based technology may have helped to encourage this social interaction, as users' attention and gaze was not focused on a device, but rather on the plants and other people.

Impact on economic sustainability

The design of the Talking Plants was partly inspired by the *RememberMe* project (Speed 2010) in which objects donated to an Oxfam charity shop were tagged with stories from the people who donated those items. The researchers found that all the tagged items sold, even those that were typically hard to sell. I was interested to test whether – in a similar vein – people would be more inclined to buy the plants that were tagged with stories, and in this way contribute to income generation for the farm. In developing the idea for the Talking Plants with the farm staff, Olivia also recognised this potential for generating sales and therefore contributing to the farm's financial sustainability. In talking about the initial idea, she said: *“I can really see a commercial application for it, for like nurseries and things”*. When I talked about selling the plants at the eco-chic market, she recognised that the technology would help, by tagging the plants with stories that *“we can then sell. Which would be quite useful. And that technology can help us be a selling point”*.

Despite hopes that the system would encourage the sale of plants, there was only one instance of a sale that was directly attributed to the plants talking (over the course of the first two evaluations – on the third evaluation the

plants were not for sale). This might have been because the plants were somewhat unusual, or because people were looking to buy plants they already knew they wanted. One of Olivia's suggestions for the audio content was to have people talk about their favourite plants. Maybe the passion of individuals, the individuals' personal stories in their own voices, would be more similar to the *RememberMe* example, and encourage more sales. However, I did not test this theory.

On reflecting on the potential to increase sales, one user thought that the system would not be so useful in a plant centre or nursery, where visitors tended to want specific answers to specific questions. Rather, it would add greater value of a less directly financial nature at an open garden weekend.

I can see it working, like, in a leisure environment so ... the garden rather than the garden centre, who is trying to sell plants. If it's a sale I think you want a specific answer to a specific question. If you're just leisurely walking about and wonder, "oh, what is this?!", like an open garden weekend, that would be something that makes you different from any other garden. So it would be a selling point. (P8)

Increasing exposure and bringing more people to the farm, which has the potential to increase donations and the volunteer taskforce on which the farm depends, was identified as a need of and challenge for the farm in Chapter 4,. Rather than contributing directly to sales of plants, the value is for the ludic encounter to make the farm stand out from other gardens, and therefore bring more people in, which in turn contributes to the farm's resilience.

Findings about the participatory process

Vines et al. (2013) argue that the primary work of HCI researchers engaging in Participatory Design research is the design of the process; that is, the configuration of the experience of participation itself. In understanding how participation is configured, researchers must understand and acknowledge what the different forms of participant interaction and engagement are, who

initiates and benefits from the research, and how control is shared with participants. In this section I describe the findings on how the community-based Participatory Design methodology of the Talking Plants study configured participation for staff, volunteers and those encountering the Talking Plants.

Configuring participation through engagement and interaction

Participation occurred at different stages, at different levels, and with different participants throughout the process of the study.

First of all, participation occurred at the initial stage of concept ideation. Participants in the exploratory study (Chapter 4) helped identify the existing needs, values and practices of the farm, which informed the motivation for the project, as well as generating some initial design concepts on which the Talking Plants project was built. For example, at the beginning of this chapter, in the section titled *Phase 1: Initial design seeds sown*, I highlighted how a diverse knowledge of food growing from around the world was held collectively at the farm, and how staff and volunteers repeatedly stressed the need for this knowledge to be made available to others. I discussed how it was a challenge for staff, whose hours had been cut due to limited funding and who were often not available to answer questions from volunteers and visitors who wanted to learn about food growing. The kind of information that people wanted, or that staff and volunteers felt should be made available, included tips for growing food, health and medicinal properties of crops, as well as other non-culinary uses, recipes, and historical and traditional uses for plants. Through discussions and workshops with staff and volunteers, we had started to develop some initial design ideas, which included an interactive touchscreen sign that would display information about food growing at the farm, and an interactive treasure hunt where visitors could learn about specific plants growing at the farm. These designs would also include recipes, growing tips, and medicinal and health-related content.

Olivia reinforced these findings from the exploratory study, when discussing the Talking Plants idea for the first time:

I mean the kind of passion that's there from people that have been growing things, and actually sharing that is as much as growing the stuff, sharing that kind of knowledge is a really powerful thing. So it would be nice to have those different voices talking about particularly a favourite plant of theirs or ... and eccentricities about plants. (Olivia)

Participation was also configured during the iterative cycle of development of the project, including planning, refining the design, and evaluation, through meetings with staff, volunteers and users of the system.

For example, as the following quotes show, Mandy and Olivia were key in developing the concept and the content through the iterative cycle:

A lot of [the plants] have medicinal qualities as well, so you can always tag a little bit of that in there, if people are really liking that. (Mandy)

Or some of the kind of folklore, the stories attributed to them, might be quite fun. If they're quite ancient plants, or native plants Because I think the culinary herbs are quite easy to explain So I guess we have to see what their selling points are, so if they've got a really amazing flower or a scent or things like that. Or if they're really hardy. Or perhaps things like that. (Olivia)

That would be good to do some of the botanical stuff. Which family it's from. (Olivia)

Mandy and Olivia also helped with the planning and logistics of making the system and demonstrating it at public events at the farm:

Fascination of plants day might be a good time to try and get some recordings, some snippets from people possibly. (Mandy)

So the medicinal one would be for the fascination of plants day, the honey ones for the strawberry fair, the exotic veg for the sewing new

seeds ... and chilli for the chilli festival I think it's quite nice to have it focused for the events because the events have a theme, and that would make sense to people. (Olivia)

Staff and volunteers also helped perform the labour in making the Talking Plants project. For example, Mandy did some research on plants, which were then used in the scripts: *“So I could give you information and then you could set it up like a little script, and then people can play it out. That would be a fun interactive thing that people could do that day”*.

Volunteers and staff contributed their voices and stories. For example, Lutfun told the story about a prize-winning chilli, and how she had brought chilli seeds from her hometown in Bangladesh, which I then incorporated into one of the chilli scripts.

Users of the system during the public evaluations also helped to refine the concept by suggesting ways to

- Improve the interactive elements:

In terms of story, it would be great if there was a way to decide which part of the story you are telling me. Because maybe I am more interested to know about this plant in history, or this plant in terms of the properties So not necessarily I want to know everything. (P1)

- Improve the concept:

I think the idea of a watering can is a good idea, but I can see that, maybe using a trowel, or something of that nature. More gardening implements. Not just a watering can, you've got other things that initiate it. (P5)

- and include different content:

What kind of environment does it need. Does it need poor soil, rich soil, watering, good sunshine to produce more essential oils. Something like that. I would look for specific information about the plant, because I do

have vague knowledge about basic gardening, so it's the more unusual species and varieties that you want to find out about, and the very specific issues about how you cultivate it and how you use it. (P8)

Maintaining control

Although I was committed to the goals of sharing control, which is an essential part of Participatory Design, on reflection it is open to question whether I shared a high level of control with the community or allowed a high level of “*genuine participation*” (Robertson & Simonsen 2012) on this project.

While the ideas for the project did evolve out of Participatory Design work as described above, the idea for a watering-can-based interaction, and for the Talking Plants, came from me and not directly from the farm community. I had considered presenting a number of designs to the farm from which to elicit discussions and agreement on which designs to implement. However, in the end I decided to go ahead with the idea for the Talking Plants without offering alternatives for the following reasons.

Firstly, I knew it was something that I could actually build, whereas the realisation of other ideas (which arose in the workshops from the exploratory study), such as for an interactive sign, was beyond my technical skills and abilities. Secondly, I was not interested in making something purely informational and useful. I wanted to build a system for ludic encounters that would be playful, thought-provoking, and curious. The third reason relates to the challenges of finding reliable participants in community-based organisations, where people may be unable to commit to a series of workshops, have irregular schedules, and may not be able to put in the time required (Redhead & Brereton 2010; DiSalvo et al. 2012). This was also my experience of the farm, as described in the findings from the exploratory study (Chapter 4). I knew it would be difficult to find committed collaborators.

Although Olivia and Mandy indicated that the Talking Plants directly supported their existing work at the farm and were happy to get involved, I worried about

taking up too much staff time when I knew that staff hours had been cut. I was also conscious that they had not initiated the project, nor invited me in.

For these reasons, I decided that it would be better to simply get on with the project at least initially, and then get input from the community on how to iteratively develop it, or move on to something else, hopefully with greater collaboration from the community. From my field notes I describe the rationale for this decision:

It is more important to do something on the farm that people can react to, rather than ask their permission to do it from the beginning. So rather than offering a number of possibilities from which participants can choose, it is more effective to build something and have people use it in order to see how to proceed. (blog entry)

Pelling argues that one of the factors which can be used to scrutinise whether an approach can claim “participatory status” is whether “*local actors at risk are also initiating and conducting the project, thereby becoming the audience for and the owners of the result*” (in Akama & Ivanka 2010). Robertson and Simonsen (2012) claim that “*genuine participation*” in design means that marginalised groups and communities are involved in the decision-making processes that will affect them. In the case of the Talking Plants, the local actors of the farm community did not initiate the project, they were not owners of the result, and their involvement in the decision-making processes was limited. As a result, I worried about a limited buy-in of stakeholders in the designed system through a sense of shared ownership (Muller 2003). This concern was highlighted by staff’s lack of engagement with the Talking Plants at the evaluations. Although Mandy and Olivia were present at the demonstrations of the Talking Plants, I was surprised and disappointed that they did not actually interact with the plants and therefore did not experience the project first-hand, only hearing about people’s reactions. However, it is difficult to know whether this is because they were too busy on the days that the study was evaluated, which were large public events (the Fascination of

Plants and the Festival of Heat days; they were not present at the second evaluation at the eco-chic market), or whether it was because they did not feel invested or interested enough in the project.

However, in conversations with staff afterwards, they said they were very excited by the project and its development. For example, when we spoke of the different kinds of vegetables and their content, Olivia wanted one *“especially for the kudu, and if you had a button you could press and it was in Bangla English. It would be good quite good”* (Olivia); *“It could be really interesting to have, verbal labels on ... different types of chillies”* (Olivia). Regarding having it ready for the Fascination of Plants day, Mandy said, *“That would be lovely”*. Mandy was particularly interested in the (unrealised) prospect of putting all the information online: *“That would be nice. I’m so excited about that bit”*. I was asked if I could present the Talking Plants again in 2014 at the Festival of Heat. Mhairi wrote in an email to me after the first of the public demonstrations at the Fascination of Plants day: *“This is amazing and we must get this out there”*.

Being embedded as a resource

Although stakeholder buy-in may have been limited for this project, the exposure it gave me to the farm continued to support the relationships I was developing with the community, and the way that I was embedded as a resource to that community.

Staff and volunteers began to imagine future uses for technology at the farm, and for incorporating some of the work I had done on the Talking Plants in other projects. For example, Richard, the growing coordinator of the newly set-up Spiralfields Community Garden at the farm, approached me one day while I was eating lunch with staff and volunteers at the farm – after the second public demonstration and evaluation of the Talking Plants project – and discussed with me the possibility of developing a listening station in the garden, which would play a soundscape of farm sounds that had been

created by an artist in residence. On another occasion he spoke to me about a radio station that some volunteers wanted to set up, with podcasts about the farm, and asked whether they could incorporate some of the audio stories around plants that I had been recording. The process of involving the community and actually building working prototypes helped members to envisage new ideas that incorporate technology that would not otherwise have been available to them. This suggests that there was some level of appropriation of the Talking Plants, in which members of the community could use the project, or parts of it, in ways that I had not intended.

Other ideas were developed with staff for future work around the Talking Plants:

We talked about the possibility over the longer term, for an augmented watering can to be left out as part of the regular plant sale area at the farm. (blog entry)

That's actually useful for us because we haven't got people around all the time and ... we're not all plant experts. I don't know the conditions for lovage. I don't retain all that information at all so ... although it'd be lovely to have someone out here all the time, that's just not feasible from a community project perspective. So it is really helpful. (Olivia)

One of the organisers of the Festival of Heat, wanted me to keep collecting chilli stories, creating a repository of chilli knowledge: *"This will really help us for the festival for next year. Because we don't have that kind of information"* (field notes).

Although the participatory process may have been somewhat limited in that the community did not initiate it and there was limited stakeholder buy-in, it was still valuable, because it allowed for the relationships between myself and the community to grow and strengthen, and it opened up new spaces for future work. As I describe in the next chapter, it was my continued involvement with the farm community, through which I presented myself as a

resource, that allowed for a deeper and more collaborative Participatory Design process to develop in the next research through design case study. This suggests that, within the constraints of community-based Participatory Design work described above (namely, the challenges of finding reliable participants who are able to commit to a more involved participation, of unstructured work schedules, and limited time commitments), rather than demanding a “genuine participation” from the start, it may be worth starting a project of interest to the designer, with limited involvement and initiation from the community, as this may lead on to new collaborative relationships, possible future collaborations, new spaces for design and appropriation of existing designs.

Conclusion

In this chapter I presented the Talking Plants, the first of two research through design case studies that were informed by the findings from the exploratory study presented in Chapter 4. The Talking Plants is a ludic encounter that was developed through community-based Participatory Design and aimed to encourage learning and participation in food growing, and to explore how such a process and the resulting artefact can broaden the design space of sustainable HCI beyond individual behaviour change.

Findings from evaluations at three public demonstrations indicated that the Talking Plants allowed for multisensory, enjoyable, interesting and accessible engagement. By giving voice to plants, the project provided a playful encounter and fostered a sense of connection, empathy and increased appreciation for typically overlooked and hidden living things. Multiple interpretations of the project included users’ reflections about the ways in which experiences of food, knowledge, self-sufficiency and well-being are interrelated, and their role as producers and not just consumers of food. In this way, the Talking Plants suggests more holistic understandings of

sustainability than as a problem to be solved through optimising individual consumer behaviour. I also gave evidence of how the Talking Plants directly supported the values of the farm, giving value to its work by providing opportunities for learning and community engagement. However, the project offered limited benefit in terms of contributing directly to sales.

Although the project grew out of the community-based Participatory Design work described in Chapter 4, and participants were involved at different stages and in many different ways, I reflected that the participatory process was limited because the community had not invited me in, nor initiated the project, and they did not own it. For these reasons, stakeholder buy-in may have been limited. I argued, however, that the process was still valuable because it allowed for the relationships between the community and myself to grow and, as I describe in the next chapter, it opened up new spaces for collaborations.

Chapter 6 – Bug Hotel

Introduction

In the previous chapter I discussed the Talking Plants, a ludic encounter with live plants that was developed with and for the farm community. I described how interactions with the playful system encouraged new perspectives on sustainability that related to empathy with, and care for, other species, and how the project added value to the farm through community engagement and by supporting the core values of food growing and education. However, I questioned the “*genuine*” participation (Robertson & Simonsen 2012) of the Talking Plants because, while the farm may have benefited from the project, they neither initiated nor owned it (Pelling 2007; Akama & Ivanka 2010) and their involvement was limited.

This chapter describes the Bug Hotel, the second research through design case study. It is an interactive living sound sculpture built and now permanently installed at Spitalfields City Farm. The aim of the study was to extend the community-based Participatory Design methodology developed in Chapters 4 and 5, by exploring what happens when a project is initiated and owned by the community, and by configuring the participation (Vines et al. 2013) in such a way that it offered a more “*genuine participation*” (Robertson & Simonsen 2012) than that described in the Talking Plants study. This methodological goal was coupled with a focus of building on the themes of the Talking Plants – namely, of providing playful and reflective experiences with hidden, overlooked elements of the farm, and exploring how this may contribute non-utilitarian understandings of sustainability and thereby expand the design space of HCI.

While these aims of greater participation may imply a more formal plan of inviting the community to suggest a project to initiate, this was not how it

happened in reality. Rather, as I describe below, the process of how the project was allowed to develop was still very open-ended and emergent, progressing through ad hoc discussions, serendipitous encounters, and the slow build of key relationships and ideas. The Bug Hotel grew out of a primary collaboration with Esther, the education officer, but also included the wider farm community through a public consultation, a contracted artist, and the labour of over a hundred volunteers and schoolchildren.

The structure of the chapter is as follows: I begin the chapter with a short overview of the project followed by a design rationale. I then describe some of the literature and projects that served as inspiration for the project. I outline the different phases of activity that were involved as a way of building a rich description of how I conducted the work with this community, including key roles and relationships. The “Phases of activity” section includes a description of the iterative design process. I then describe how I conducted the thematic analysis on the data, followed by findings from this analysis, which is presented as a series of themes and sub-themes.

One of the contributions of this thesis is a rich description of the process of working with the community. Therefore, in this chapter I have attempted to document how, why and with whom decisions were made.



Figure 46: The Bug Hotel

Overview of design

The Bug Hotel is an interactive living sound sculpture that was built, and is permanently installed, at Spitalfields City Farm. It provides a habitat for beneficial insects and pollinators. For humans, it provides a space to slow down and take time out from the stresses of modern living. It is an experiment

in interspecies cooperation, a place for rest, meditation, contemplation and education. Two to three people at a time can enter into the Bug Hotel structure and sit down. Inside are two headphones. The right headphone streams live audio from microphones located inside a beehive that is sited around 20 metres away from the Bug Hotel, in an area that is off limits to visitors. A rotary switch with five channels controls the left headphone. The first channel plays audio from 10 contact microphones hidden within the cavities of the Bug Hotel. One can either hear the bugs (if there are any), or listen to the sound of rain falling on the gutters or of someone playing the Bug Hotel with their hands or sticks, like a percussive instrument. Channels 2–5 play pre-recorded tracks of different insect sounds from around the world, including a recording I made from within the farm's beehive two days before the colony died. The walls of the Bug Hotel are lined with informational charts of different insect species.

The physical structure of the Bug Hotel was designed primarily by an artist, my long-time collaborator and partner, Franc Purg, together with input from Esther and myself, the education coordinator. Franc built the structure together with over 100 staff and volunteers at the farm.

Design rationale

The Bug Hotel was designed for playful interactive encounters with a living sound sculpture. It was aimed at providing people with a space in which they could slow down, take time out from the hectic pace of London, connect with nature and reflect on their relationship with other species. It was also built as a habitat for beneficial pollinating insects such as bumblebees, spiders and ladybirds. Sound was used as a way to amplify and make accessible the hidden lives of insects, and to consider non-human species that visitors may not typically think about.

By installing the interactive sound elements into the physical structure, I was interested in designing an enjoyable and playful system that was educational, but not didactic. The project aimed to allow for open-ended interpretations that would complicate or disrupt simple and dominant narratives of sustainability. Inspired by the values of reflection and contemplation from slow technology, I wanted to design a system that could be used for meditation and taking time out from the daily activities and pressures of urban life (Hallnäs & Redström 2001). By continuing the strategy of revealing and amplifying the hidden, overlooked aspects of the farm, the project aimed to provide opportunities for reflection about our place in the world and our relationship with other species. In addition, the Bug Hotel was to function as a resource for the farm, prompting conversations between people and thereby helping to connect the community and make it stronger.

The project evolved out of a key collaboration with, Esther, the education coordinator. While the reflective, playful aims of the project were grounded in my experiences and interests as an artist-designer, these were balanced with Esther's aims, which were grounded in her educational role at the farm, her work with children, and her desire to make greater links between the different aspects and spaces of the farm. The project incorporated her aims, which were to provide educational experiences, and to help the farm become more cohesive. As I describe in greater detail below, it was through the Bug Hotel that my aims and Esther's aims could meet.

Furthermore, the project incorporated the artist Franc Purg's aims, which included aesthetic considerations. Because we wanted it to be an attraction that draws people as well as insects, the visual appearance was important. While we were inspired by images of bug hotels on the internet, many of these looked messy and hastily put together, sacrificing visual appearance for functionality. However, Esther was particularly taken by one example online in which much thought had been given to form as well as function, and it looked like a minimalist Zen painting. We presented this to Franc as an example to

consider for inspiration, but gave Franc full licence to follow his own artistic vision.

Aside from the aesthetic and structural decisions taken by Franc, the design of the Bug Hotel in its final form embodied all the groundwork I had done previously. This included the exploratory study (Chapter 4), the Talking Plants (Chapter 5), and a bee listening station that I had been developing together with Esther, which I describe in more detail below. This ongoing involvement with the farm community helped us to focus on the design aims described above.

Related work

Examples from the HCI literature and the internet provided inspiration for the project as it evolved over the course of its development.

The *Prayer Companion* (Gaver et al. 2010) is a project intended as a resource to the work of a community of elderly cloistered nuns. A device streams information from RSS news feeds and social networking sites to suggest possible topics for prayer. It is an example of research through design that explores the themes of balancing openness and specificity of interpretability in design, the importance of materiality to the device's successful adoption, designing for older people, and designing for spirituality. The authors reflect on how the device generated conversations amongst the nuns as they went about their daily routines.

I was inspired by the way in which the device became a resource to the community, by directly supporting the nun's work of prayer, but also less directly by providing opportunities for social interaction and dialogue amongst the nuns. Likewise, I wanted the Bug Hotel to be a resource to the work of the farm and to provoke discussions, thereby contributing to community cohesion. I was also interested in how the project aimed to support the work of a community. However, the contexts differ significantly because the nuns

formed a settled community who lived where they worked, whereas the farm is a community-based organisation with a changing, non-stable population.

Another project that provided inspiration was the *Indoor Weather Stations* (Gaver et al. 2013). The three devices (described in Chapter 2) were designed to challenge utilitarian narratives of sustainability, and present the microclimate of the home as a topic of environmental concern and also aesthetic concern.

The project used ambiguity as a resource, and was aimed at exploration, surprise, improvisation and wonder as useful tools in approaching complex and serious issues. I was inspired by the playful, ambiguous nature of the designs and how they inspired multiple interpretations and reflection, trying to open up new spaces for design in sustainable HCI.

I was also inspired by *Cow-Cam.tv* (Bissas & Agamanolis 2012), which is an example of slow technology used to provide for reflection, connection with nature and other species. The project consists of Grace, a 14-year-old Highland cow, who wears two custom-built CCTV cameras and wirelessly transmits video footage from her point of view. “*How does a cow spend its day? What really matters to her? Would it make any difference to our daily routine to have instant access to a parallel slow-paced world?*” (ibid.).

The video was presented on the *Cow-Cam.tv* website, where visitors were encouraged to leave feedback. Watching the video of the rural scenes that formed Grace’s environment prompted comments such as “*why would you kill such a beautiful animal?*”; “*you make me miss the countryside*”; “*I love the Cow-Cam, it is so relaxing*”; and “*I’m going to get rid of the television!*” (ibid.).

I was inspired by how the technology helped reveal the point of view of another species and how seeing the world through her eyes prompted an empathy with the animal and its surrounding nature. I was also inspired by how it drew on principles of slow technology to create a space for

contemplation and reflection on values that might have been lost in the hectic pace of urban life.

Finally, the *Wearable Forest* (Kobayashi & Ueoka 2008) also influenced the Bug Hotel, as it describes a garment for connecting wearers with flora and fauna in a remote forest, allowing them to hear the live forest soundscape. I was inspired by the way that sound connected users with nature, and by its use of technology in enabling users to feel a sense of belonging to nature wherever they are located. This can be seen as an example of *human–computer–biosphere interaction* (Kobayashi 2015), which uses technology to “increase people’s awareness of nature and facilitate benign interaction with nature”. I was inspired by the ways in which the project attempts to focus the user’s attention on nature in their daily lives by including the typically overlooked sounds of animals, insects and the natural elements.

Phases of activity

As with the previous study (the Talking Plants, Chapter 5), an iterative, phased approach informed the design process of the Bug Hotel. These phases of activity took place over a period from May 2012 to July 2014. This process was highly emergent and dependent on the developing key relationship between Esther and myself.

The evolution of the project can be described according to a number of phases of activity:

- Phase 1: Initial seeds sown
- Phase 2: Making the bees accessible
- Phase 3: Thinking of a bug hotel
- Phase 4: Consultation
- Phase 5: Building the structure
- Phase 6: Initial sound design

- Phase 7: Refining the design
- Phase 8: Final evaluation.

The aim of describing these phases of activity in depth is to provide a rich narrative of how I worked together with the community. This answers the call within the research community to provide more detail and articulation of the design processes and how relationships develop and unfold within Participatory Design research over time (Light 2010; Vines et al. 2013).

May 2012	March 2013	April 2013	May 2013	June 2013
<i>Phase 1: Initial seeds sown</i>	<i>Phase 2: Making the bees accessible</i>			
Esther approaches me after completing the exploratory study to discuss ideas for how technology can help her work – she brings up the chicken sounds CD	Meeting with Esther to present my idea for microphones inside beehive	Microphones inserted into beehive	Esther and I identify a site for the bee listening station	Bee colony dies
June 2013	July 2013	July 2013	July 2013	Sep–Oct 2013
<i>Phase 3: Thinking of a bug hotel</i>			<i>Phase 4: Consultation</i>	<i>Phase 5: Building the structure</i>
Esther talks to me about building a bug hotel and identifies potential site	Artist Franc is recruited and initial sketches made	Meeting with Franc, Mhairi, Esther and myself to discuss initial designs	Consultation with farm community	Structure built with help from volunteers
October 2013	Nov–Dec 2013	June 2014	June–July 2014	July–August 2014
<i>Phase 6: Initial sound design</i>		<i>Phase 7: Refining the design</i>		<i>Phase 8: Final evaluation</i>
Microphones go into structure	Building amplifier system for microphones	Observations of use and meetings with Esther	Refine design to include live beehive sounds and pre-recorded sounds	Observations of use and final interview with Esther

Table 5: Phases of activity

Phase 1: Initial seeds sown

The initial seeds for the project were sown in 2012 immediately after the last workshops of the exploratory study described in Chapter 4. Esther approached me with some ideas she had for incorporating technology into her educational work at the farm. At that time, Esther had just begun working at the farm and was a full-time employee, working with school-age children both on the farm and at various schools. Her job involved teaching them about life cycles and natural ecosystems, food growing and healthy eating, recycling and composting, and all things related to sustainability and the environment. She explained that she was interested in exploring what animals, plants and humans need to survive: how we look after plants and animals, and how this care relates to how we look after ourselves. The workshops described in Chapter 4 had prompted her to think of ways that technology could be used in her educational work at the farm and she approached me to see if there was something we could develop together. For example, she had a CD with chicken sounds, and was thinking of integrating it into some kind of sound-based interactive educational resource for kids with special needs. She also had ideas for items you could wear to help you experience what it is like to be an animal, e.g., special glasses to show you how a bee sees. I felt a rapport with Esther and a desire from her to collaborate.

Phase 2: Making the bees accessible

At the time, there were a lot of stories in the news about the plight of bees around the world – namely, the colony collapse disorder that is mysteriously wiping out entire bee colonies all at once. The significance of this to humans is that bees pollinate the majority of our food, so if bees die out then so will we. The farm had been contributing to national campaigns by distributing packets of seeds of bee-friendly plants to the public, and by including more signage indicating which plants growing at the farm were bee-friendly. Around the same time, graffiti highlighting the significance of the bee crisis appeared on a nearby street that I passed each time I cycled to the farm (Figure 47).



Figure 47: Graffiti of bees on wall in Tower Hamlets, close to Spitalfields City Farm

I started thinking of bees. I knew that Esther was a beekeeper and had recently established the first beehive at the farm. The beehive was in the wildlife garden, in an area that was off limits to visitors due to safety concerns (i.e., to prevent kids and others being stung). There was a little sign at the entrance to the wildlife area indicating that the bees were there but that entry was forbidden (Figures 48 and 49). So people who visit the farm knew there were bees, but nothing else about them. I thought about Esther's desire to incorporate sound-based technology into the farm to help educate people about the animals.



Figure 48: 'No entry' sign to bee area

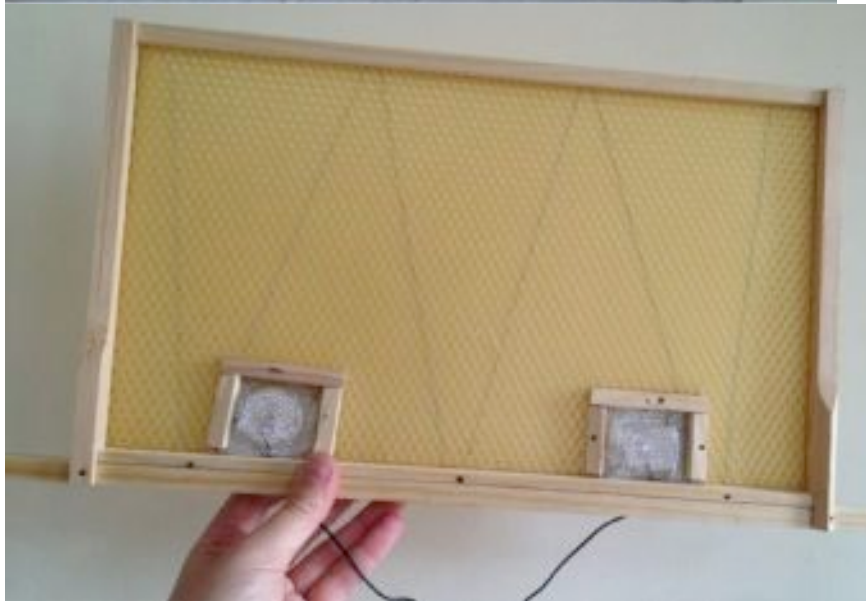


Figure 49: Enclosure of beehive in an area that visitors cannot enter

I had recently read about Eddie Woods, a BBC sound engineer and a bee expert who spent a great deal of time listening to bees. He claimed that one could learn about the health of a colony from the sound inside the hive, and in the 1950s he made a simple audio frequency amplifier called an apidictor, which he inserted into a hive to listen to the bees. By knocking on the hive and listening to the resulting hiss, Eddie Woods claimed that it was possible to predict if a hive was about to swarm: if the hiss is sharp, the hive is healthy; if it is slower and rounder, then the bees are preparing to swarm.

Inspired by reading about Eddie Woods' experiments with recording beehive sounds, in March 2013 I met Esther again to talk to her about an idea I had of putting microphones into the beehive and having a listening station somewhere central at the farm, as a way to make the beehive more accessible and help educate the public about bees. Esther was very excited about the idea and said that that would be a "*dream come true*". I did not know where this would lead. I thought of it more as a kind of probe, a prototype to provide a springboard into something else. Also, I felt that it tapped into the values of the farm and could act as a resource and was therefore worth pursuing.

At the end of April 2013 I adapted a beehive frame with condenser electret microphones and inserted it into the beehive. We had to wait for a warm sunny day without wind before opening it up.



Figures 50 and 51: Details of microphones in beehive frame, covered with metal mesh



Figure 52: Esther inserting the frame into the hive

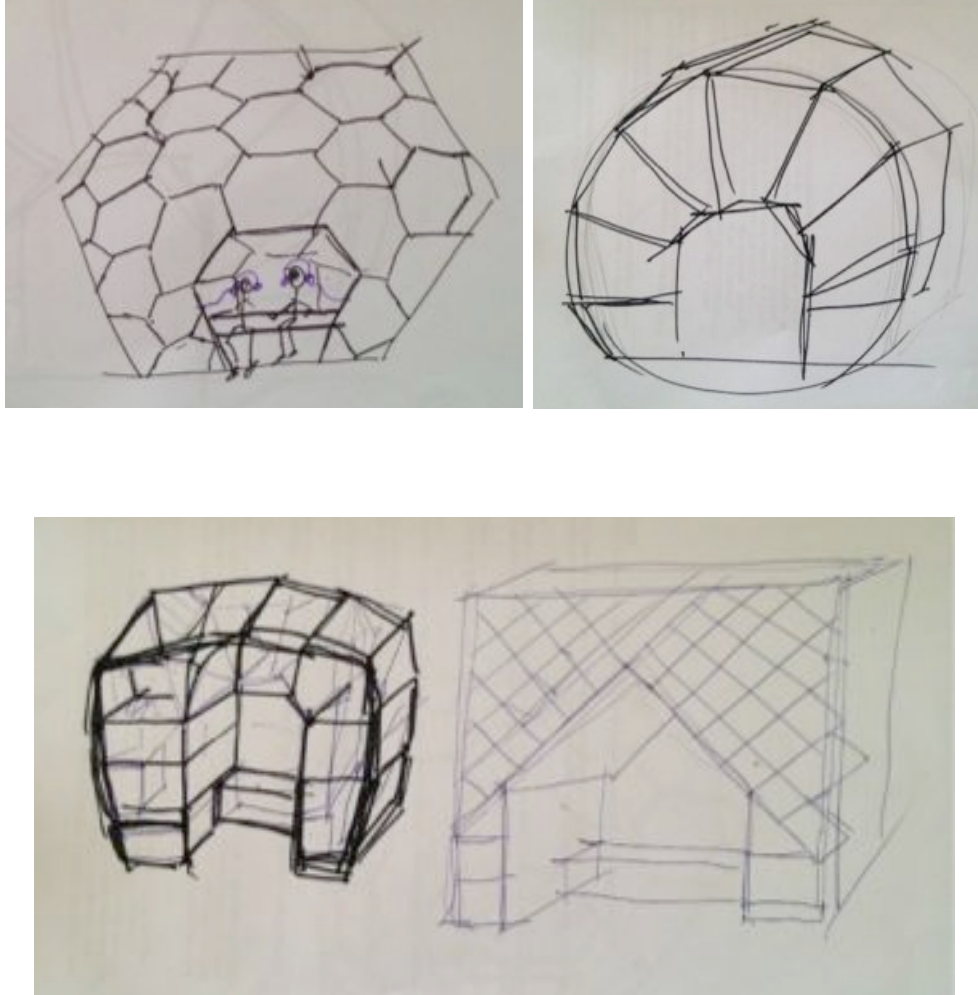
In May 2013 Esther and I identified a site for the listening station – at the entrance to the wildlife garden. We set a target date for getting a working prototype of the bee listening station in place of 14th July, in time for the Strawberry and Honey Fayre. However, in early June all the bees suddenly died. Interestingly, I had made a recording of the bees two days before the colony died. The sounds from inside the beehive were markedly different from the recordings I had previously made of the bees: the hum was much more high-pitched, a frantic, distressing sound. In hindsight, listening to this audio track, it seemed clear to me that something was amiss with the colony, and that Eddie Woods was right in saying that you could tell something about the health of the colony by its sound.

Phase 3: Thinking of a bug hotel

Around the same time that the bees died, Esther approached me again one day at the farm for a meeting about the Talking Plants. She showed me a space that she had identified to build a large bug hotel. This would be a large structure, made from recycled materials, and with lots of holes for different insects to live in and lay eggs. She wondered if it could incorporate the bee listening station. This idea made sense to me. We spoke of having some pre-recorded bee sounds as well as live bee sounds and of how young visitors to the farm could help build it.

I lacked the skills to build such a large structure so in July I recruited Franc Purg, an artist, sculptor and long-term collaborator of mine who shared my interest in sustainability. (For example, we had worked with rubbish recyclers in Cairo to produce an artwork that subsequently won a UNESCO Digital Art Award in 2007.) Franc would build the structure with the help of volunteers, I would develop the technology, and Esther would do the educational side of it and involve kids in filling the cavities.

Franc made some initial sketches (Figures 53, 54 and 55) and we presented these at a meeting with Mhairi and Esther in July 2013. The four of us agreed on the suitability of one of the designs and chose this one to build, as it would reuse a metal structure that was already located in the place that Esther had identified for the bug hotel. This metal structure had been part of a musical sculpture donated by a local music group. It had been partly dismantled due to health and safety concerns, but the external metal frame was still strong (Figure 56).



Figures 53, 54 and 55: Initial sketches of Bug Hotel by artist Franc Purg



Figure 56: The metal structure from the donated sound sculpture

Phase 4: The consultation

In the same meeting discussed above we decided that it would be in keeping with the values of the farm as well as the Participatory Design values of my research to conduct a public consultation at the farm, as this seemed the most appropriate and inclusive way to seek as wide a variety of views and participants as possible.

Rather than focusing on the visual aesthetics of the design, the consultation would seek people's opinions, concerns and ideas regarding its use. As Mhairi explained,

What we really need to know is, is it going to be used. How would you use it? What would you need to be able to use it regularly? ...

Where do we put signage? How do we tell people about it? How's the listening station going to work?" (meeting with Mhairi, Esther and Franc)

It was a way to try to understand whether it would have relevance to them, particularly to the people that already use that space – namely, young children and families – as we were locating it in the children's play area next to a large and very popular treehouse.

The consultation took place in the yurt (the farm's main indoor meeting space) on a Wednesday afternoon in July from midday to 2.30pm. We decided on this time because the farm is generally full of volunteers, and this day was no exception. There were regular volunteers in the gardens and animal farmyards, corporate volunteers, and families with small children. People were building, cleaning, gardening, talking, playing and eating.

A number of signs, placed at the centre of the farm, and at the entrance to the yurt, directed people to find out about the Bug Hotel.

In the yurt we displayed four A1 posters. One showed a visualisation of the Bug Hotel design. Another showed various pictures of existing bug hotels collected from the web. Two posters posed questions and invited participants to post their answers. The first asked for responses to general concerns: Why should we make a bug hotel? How would you use it? What are your concerns and fears? Would you go inside it? Thoughts on long-term usage? The second of these posters sought responses about practical considerations including:

- How do we incorporate educational content?
- How do we incorporate signage and let people know about the Bug Hotel?
- Could technology help us any other way?
- How can we incorporate people's feedback into the structure?
- Any ideas about the listening station?

On a large trestle table we provided sticky notes, coloured markers and pens. Esther brought along a display beehive, with pictures of bees on frames that could be removed from the hive and inspected. People could inspect and touch live African land snails that were inside a small aquarium. A CD with two pairs of headphones played sounds recorded from inside the beehive. There was also a piece of empty honeycomb that people could hold, as well as various leaflets about different species of insect.

We left the display up in the yurt for one week after the consultation, in order to allow visitors, staff and volunteers who had been unable to come to the Wednesday consultation an opportunity to add their views.

Around 40 people attended the consultation on the Wednesday. This included nine members of staff (that is, all except for one); seven regular volunteers; six corporate volunteers; a film-maker who was setting up a film event that night; three families with small kids; and a number of visitors and volunteers who popped in and out. Another 10 or so came during the following week and left handwritten and hand-drawn responses.



Figure 57: Sign directing people into the yurt



Figure 58: Detail of poster showing design concept of Bug Hotel



Figure 59: Detail of posters inside the yurt during the consultation session



Figure 60: Detail of table with different materials for people to engage with



Figure 61: Detail of poster with comments

Phase 5: Building the structure

The artist Franc Purg built the structure during September–October 2013 with the help of over a hundred volunteers. Many of these were corporate volunteers – groups of employees from large companies (typically banks and insurance firms) who spend a number of days at a charity as part of the company’s corporate responsibility programme. They were enlisted to help build a strong foundation and move the heavy metal structure into place, and to saw, drill and lift different types of wood. The construction of the Bug Hotel became a bit of an attraction at the farm that piqued the interest of people passing by. Franc reported having frequent conversations with people who were curious about what he was building and why.

Phase 6: Initial sound design

The initial sound design consisted of two listening stations inside the Bug Hotel, one on the left side and one on the right. Each had a set of headphones. Next to each set of headphones was a dial with five channels. On the left side each channel connected to a different pair of microphones inside the left side of the Bug Hotel. On the right side, the first four channels came from the remaining microphones from inside the right side of the Bug Hotel, while the fifth channel was a live feed from the beehive. On each side, the microphones were connected to a rotary switch inside a small cupboard, which directed the chosen pair of microphones to two small audio amplifiers.

Visitors could pick up a set of headphones and change the dial to listen to a different pair of microphones. The idea was that visitors could hear the different bugs inside the cavities. Until the bugs took up residence, the Bug Hotel could function like an interactive sound sculpture – by stroking, scratching or hitting the different surfaces of the structure you could produce different sounds. We thought the contact microphones in the gutters would provide an interesting sound when it rained.

Design constraints

There were a number of requirements and constraints for the design of the Bug Hotel. As there was no mains electricity available at the site, the system needed to be powered by alternative means. I installed two solar panels on the roof to charge five-volt batteries that would power the amplifiers. The Bug Hotel was to remain in situ through all weather and at all times. Therefore, it needed to be robust enough to withstand unsupervised public use, and it needed to be vandal-proof and weatherproof. The electronics for the listening station had to be incorporated into the structure, where space was limited. Finally, it needed to be able to run on its own without staff maintaining it or attending to it.

Phase 7: Refining the design

The existing design had some problems. After returning from the USA, where I was a visiting researcher at Georgia Tech January–April 2014, I went to the farm to meet Esther and hear about how the Bug Hotel had been used while I was away.

Esther explained:

I'm not sure the idea works in practice. We knew it was experimental about what we would hear What makes it tricky is, how do you know if you're not using it properly, or it's broken, or there's nothing to hear.

People, she said, like playing with it but then assume it's not working. Also, the concept was inherently flawed – we were asking people to play the Bug Hotel as a musical instrument by hitting it with sticks, but if there ever were bugs inside, then they wouldn't want to stay “*because they'd be battered*”.

On my return to London I also conducted two observation sessions to see if I would see people interacting with it in the ways reported to me by Esther. One observation session was on 30th May 2014 on a regular weekday, and the

second was on Sunday 8th June, at the Sheep and Wool Fayre, one of the many special festive events held at the farm throughout the year. My observations confirmed what Esther had reported: that it wasn't working.

We decided to go back to the original idea of incorporating some pre-recorded sounds of insects in order to draw people in and get them interested. The right side would have only a live feed from the beehive, while the left side would have one channel from the live microphones, while the other four channels would play pre-recorded sounds. Esther even thought of including some music – for example, Ivor Cutler's song 'I Believe in Bugs'. As she explained,

It would retain some interactive potential, in fact it would make it more interactive Bit of music, something different. I think variety wouldn't harm it at all It would be fun to have different buggy things Nursery rhymes. Then there really is something for everyone.

However, in the end I decided against this, as I thought it would make it too obvious and take away from the reflective aims. I pick up on these tensions in the "Findings" section below.

Left side

I connected up all 10 microphones on the left side to the first channel on the rotary switch (dial).

Channels 2–5 were connected to pins on an Arduino Uno, which had a Adafruit Waveshield for audio playback. Four audio tracks of bug sounds from around the world were loaded onto an SD card and inserted into the Waveshield. I sourced these tracks from a web repository,¹² and chose the most interesting, unusual or musical sounds that I could find. Channel 5 played the audio I had recorded from within the beehive at the farm, two days before the colony had died. As I discussed above, the sound was of a very

¹² <http://www.ars.usda.gov/sp2userfiles/person/3559/soundlibrary.html> (accessed 1st September 2015).

high-pitched and frantic hum, and it evoked in me a painful feeling, as I imagined the colony in the utmost distress.

Power was a problem that I struggled to solve. As battery life was a consideration, I programmed each pre-recorded track to play once only, without looping. Only when the rotary switch (dial) changed did it play a new track. If the dial was set to Channel 1 there was a constant live feed from the microphones, as these draw very little power. However, the system was still drawing too much power. Sound would only start working in the afternoon once the solar panels had managed to adequately charge the battery.

In order to save battery, Franc and I replaced the pegs that the headphones rest on with special hangers that act as switches (Figure 62). We incorporated a micro switch into the headphone hanger so that, when the headphones are replaced and resting, the power to the system is cut. When the headphones are lifted off the hanger, the power is connected. In this way the headphones only draw on the battery when they are in use.



Figure 62: Headphone hanger incorporating the micro switch. The system is powered only when the headphones are lifted off the hanger

A printed playlist hangs on the wall next to the headphones and explains what each channel plays. In addition, there is a diagram that shows where the microphones are hidden inside the cavities and prompts people to play it like a musical instrument.



Figure 63: Detail with playlist and legend for where the microphones are located and instructions

Turn the dial to channel 1.
There are microphones hidden inside the bug hotel. The red dots show where they are.
Can you hear any bugs? Can you hear the rain?
What if someone taps the wood with a stick while you listen.....



Figure 64: Information sheet inside the Bug Hotel on the left side

Bug Hotel Playlist



Channel 1: Live feed from microphones inside the bug hotel (see legend for position of microphones)

Channel 2: Death watch beetle in a living oak tree, (recorded by Peter Tolly)

Channel 3: *Cotesia marginiventris* (Braconid parasitoid calling song), (recorded by John Sivinski)

Channel 4: *Reticulitermes flavipes* (Eastern subterranean termite) recorded in soil under a pine tree

Channel 5: Bees from inside beehive at Spitalfields City Farm, 2 days before they all died, (recorded by Sara Heitlinger)

Tracks 2,3 & 4 from the website:
<http://www.ars.usda.gov/sp2userfiles/person/3559>

Figure 65: Bug hotel playlist for left side

Right side

I removed the amplifier from the right side, as we decided to only have live bee sounds directly from the beehive. The sounds come from the two electret condenser microphones inside the hive, along a 30-metre-long shielded audio cable that runs along the train line at the back of the farm. The microphones are powered by a small pre-amp with automatic gain control as a way to overcome the large discrepancies between the volume of the bees and the intermittent trains going past on the East London line, five metres away from the beehive. The pre-amp connects to a five-volt battery, which is charged by a solar panel. The microphones and pre-amp draw very little current and the battery is always charged.

A sign on the right side indicates to visitors that the sound is live and comes from the beehive.



Figure 66: Sign indicating where the sound comes from

Phase 8: Final evaluation

The final phase of activity involved collecting data about how people are using the Bug Hotel after refining the design. This involved an observation session at the Strawberry and Honey Fayre on 13th July 2014, which was a well-attended festival and at which I observed people interacting with the Bug Hotel for two hours. It also includes a final wrap-up interview with Esther, held in July 2014. In the interview I asked Esther about how people perceived and used the Bug Hotel, her own experience with it, as well as her reflections on our collaboration and the process of making it. Although there were many discussions with the farm community about how to best capture feedback about the Bug Hotel over the longer term, given the limits of time available to the project these remain within the realm of future plans.

Data analysis

The findings in the next section are the results of a thematic analysis of the transcription of a final wrap up interview with Esther, after completing the Bug Hotel. This interview was conducted and recorded in mid-August 2014, about six weeks after the final design was finished and implemented.

The reason for basing the analysis primarily on the final interview with Esther is that she was the one who had been taking people to the Bug Hotel and observing them using it on a daily basis. Therefore, she had the most insights into how the Bug Hotel was being used and, by talking with them, had gained much insight into their experiences of it.

The interview with Esther is also supplemented by the following data:

- My field notes as written up in my blog from visits, conversations, meetings, observations and reflections from the period as described in the “Phases of activity” section above
- Detailed observations of people interacting with the Bug Hotel including
 - Two observations of the initial sound design on a regular weekday (May 2014) and at the Sheep and Wool Fayre (June 2014)
 - One observation of the refined design iteration at the Strawberry and Honey Fayre (July 2014)
- Additional data came from photographic documentation of the Bug Hotel.

As with the previous two studies, I applied a deductive thematic analysis (Braun & Clarke 2006) on the data set. Chapter 3 describes in detail my rationale for using this method of analysis, as well as the steps that I took in undertaking the analysis, which were the same for the three studies.

The deductive, or theoretical, approach to the data means that the codes are generated by examining the data with specific questions or interests in mind. In analysing the data, I was interested in exploring the following questions:

- How do people experience and interact with the Bug Hotel?
- How do they interpret it and make meaning from it?
- How does it support and add value to the farm?
- How does it contribute to understandings of sustainability?
- What worked and didn't work about the community-based Participatory Design methodology, including tensions and challenges that arose?

Although I conducted a deductive process of coding the data, I also coded parts of the data for things that I was not looking for if they seemed interesting, surprising, or potentially relevant.

I acknowledge the active role I brought to this process, making choices according to my research interests and my experiences as a socially engaged artist, and grouping them in a way that made sense to me.

The results of the thematic analysis are presented in the "Findings" section below, and presented under the thematic headings and subheadings as organised by the thematic map generated through the analysis.

Findings

In this section I describe the findings from the thematic analysis of the data set described above. These have been organised into the following themes and sub-themes:

How people experience the Bug Hotel	<i>Multisensory experience</i> <i>The Bug Hotel as a playful experience</i> <i>Appropriation of the Bug Hotel</i> <i>Finding the sweet spot</i>
Adding value to the farm	<i>Sustainability</i> <i>Making the farm more cohesive</i> <i>Participating in the event</i>
Community-based Participatory Design	<i>Mutually satisfying collaboration</i> <i>Community members as experts</i> <i>Responding flexibly</i> <i>Participatory Design process contributes to values of the farm</i> <i>Never-ending process</i>

Table 6: Themes and sub-themes

Unless otherwise specified, the quotes come from the final interview with Esther.

How people experience the Bug Hotel

In this section I describe the findings in relation to how people experienced the Bug Hotel. I discuss how the visual, auditory, tactile and immersive qualities of the Bug Hotel contributed to engagement. I then discuss how the farm in general, and Esther in particular, have started to appropriate the Bug

Hotel in ways that I could not have predicted. Finally, I discuss how the Bug Hotel negotiated finding a sweet spot between incomprehensibility and banality.

Multisensory experience

The Bug Hotel provides a multisensory experience that incorporates the sense of sight, sound and touch, as well as an immersive experience.

The **visual** aesthetics of the Bug Hotel made it into a spectacle or attraction at the farm. As Esther commented: *“I think it's just kind of beautiful It's beautiful and visual and immediately kind of there and interesting for people There's something in it about being quite a spectacle”*. My observations confirmed this: people were immediately drawn to it, invariably pulling out their phones to take a photo of it, either on its own or with their friends posing in front of it, as one does in front of a monument or attraction.

While the visual aspects drew people in initially, it was primarily the **auditory** elements that kept them there.

The sound aspect ... just magnifies [the experience] so much. It's really brilliant Without the sound in there you could go and sit in the Bug Hotel but I'm not sure you would. Whereas with the sound in there you go and sit and have a listen, and then people can sometimes stay there for a bit even when they're not listening.

This became even more apparent when the sound was not working. As Esther commented,

The technology just really enhances it because, well for a start when the technology didn't work, ... you try something and “oh it's not working”, and you leave it and don't really explore any more. But as soon as there's something there, there's what you listen to in itself And there's something to come back to. Especially having something

live really adds to that. And another thing to play with. It adds another sense to it.

Before we incorporated the pre-recorded sounds and live beehive sounds, I observed many people go in, put the headphones on, change the dial, and then a second later replace the headphones and leave. Only very rarely did someone read the instructions and try to tap the surfaces with a stick or their hands, to find where the microphones were. Once we refined the sound design to incorporate the live bee sounds and the pre-recorded sounds, people spent much more time inside and outside the Bug Hotel. Children in particular spent a lot of time in the Bug Hotel, sometimes up to half an hour. I observed children go outside to play in the treehouse and come back to listen again. Sometimes there were four or five kids inside. At other times, there was a mixture of kids and adults, who did not know each other, all jostling for space at the same time. I even observed queues of people waiting to go inside to listen.

In addition to drawing people in and keeping them engaged, it is primarily the sound, rather than the visual elements, that prompts conversation. Rather than compromising face-to-face interaction and discussion, the sound encourages it. Esther explained: *"[The sound] makes people engage with other people and bring other people in"*. During my observations I heard people frequently comment to each other about the sounds, telling others about what they are hearing, encouraging others to have a listen, as demonstrated in the following quotes (from my field notes). A boy tells his father, *"Daddy you must hear it. You can hear buzzing insects"*. A man tells his daughter, *"That's the bees"*, and when she puts the headphones on she says, *"This is very cool! The bugs are really in my ears! Arrrgggh. Stop it bugs!"* One listener says, *"Listen to that one"*, while another says, *"Very weird"*. A group of kids imitate the bug sounds, humming like bees and tapping like some of the recordings.

The sound element of the Bug Hotel has also helped create new meanings and relationship with other species. The bees were hidden away in a part of the farm that was off limits to visitors, because they were considered dangerous to the general public. Also, the bees in their hive are completely inaccessible, until someone takes the lid off. Therefore, the sound has made the bees accessible because visitors can now hear them and have access to their hidden world. It has allowed people to experience what they would not otherwise be able to experience by exposing something that would otherwise remain hidden. As Esther explained,

The thing with bees was, or is for me, the fact that you can't really have the bees right in the middle of the farm, really really completely accessible for everyone You can have them in a place where you can kind of look at it, but to actually make that kind of meaningful How to get inside the hive when you can't physically get there.

The live sound has provided the means to make the hidden accessible and in this way offers the potential for people to create personal meaning and provoke reflection.

Esther's comments that the sound magnifies the experience and encourages people to come in, sit down, and possibly even come back echo the slow technology category of *Soniture*, in which "Using the sound as a central property of material amplifies the presence of things and makes learning and understanding slower" (Hallnäs & Redström 2001). By providing the sounds of the beehive and the other insect environments that we do not usually have access to, these environments become amplified.

In addition to the visual and auditory senses that the Bug Hotel engages as described above, it also offers a **tactile** and **immersive** experience in which people can physically engage with it by touching the surfaces, pulling out the contents and helping to refill them. They can also sit inside it and be

encompassed by the Bug Hotel and the idea of being surrounded by insects. Esther commented: *“I think it is important that ... people can fiddle with it and be in it”*. Esther worked with many school groups to fill the cavities of the Bug Hotel, and this is an ongoing task as other kids remove the filling materials and leave new spaces to be filled. Once I observed a girl of around 10 years old occupied for 30 minutes filling with sticks the small holes that had been drilled into a cross section of a tree trunk at the front of the Bug Hotel – holes that were intended for insects to occupy. She was thoroughly preoccupied with her task, and *“in the zone”* (to quote Richard from Chapter 4).

The Bug Hotel as a playful experience

Esther reflected on the Bug Hotel as a playful object, and on how this playfulness helps people engage with it. *“I think [playfulness] makes people really engage with it. And I think it's not just me that's excited by it when I use it or see people using it. I can hear people, 'Hey, come and listen to this”*.

Reactions to the Bug Hotel vary, but often include surprise. *“People get quite surprised. People are surprised. They are hearing something they haven't heard before. And I do see just different reactions. That's amazing in itself”*.

Esther reflected on how the playfulness contributes to thinking about sustainability, as an alternative to “worthy” or didactic messages around environmentalism:

[The Bug Hotel is] not a sort of toy ... it's playful as well as purposeful I think it is really important, because there's quite sort of worthy messages around about environmentalism And then, when you come nearer to it then I just think there's lots of ... it gives you lots of things to think about and experience.

It is the reflective, thought-provoking elements of the Bug Hotel that allow for different layers of experience and personal meaning-making. In this way, the Bug Hotel is similar to the Indoor Weather Stations (Gaver et al. 2013): *“the*

playful approach of ludic design does not imply frivolity, but instead that exploration, surprise, improvisation and wonder can be useful tools in approaching complex and serious issues”.

The surprise and new experiences generated by the Bug Hotel can then lead to interest, inspiration and action. Esther explained: *“It can develop into interest ... and it can kick off ideas. So it can be a sort of inspiration point for people”*. In fact, Esther directly credits the Bug Hotel with two groups of young people – a school group and a young farmers group – subsequently building their own bug hotels after experiencing ours. This concrete example gives evidence of how the project has contributed to more sustainable practices.

Appropriation of the Bug Hotel

The ambiguous and non-prescriptive nature of the Bug Hotel allowed for appropriation by different segments of the farm community, including both humans and other species. While I consider appropriation to be a measure of the Bug Hotel’s success, I describe in this section how appropriation by one species may come at the expense of another’s; furthermore, evaluating appropriation by non-human species may involve longer time spans than was possible within the scope of this research.

The relationship that Esther and the farm have developed with the Bug Hotel indicates a deep conceptual appropriation (Gaver et al. 2003). By employing ambiguity as a resource and by not dictating a top-down authoritarian idea of how the Bug Hotel should be interpreted, the design has allowed the community to fill in the gaps, or connect the dots between the technology and their own values and beliefs.

First of all, this is most clear in the ways in which the Bug Hotel took on personal significance and meaning for Esther, both in her educational work with young people, but also in connection with her passion for and interest in the bees. As the person who is responsible for the bees at the farm, the Bug

Hotel acts as a resource for her work. The first time we put the frame with microphones into the beehive and she could hear the bees through headphones, she sat there listening for 10 minutes or so, and when she finally handed over the headphones she was very excited and said that she would be happy to listen all day long. She acquired her own listening device that she could plug the trailing microphone jack into, so that she could regularly listen to the bees without having to wait for me finish installing the listening station.

Once the Bug Hotel incorporated the listening station, it became a regular place for her to visit, directly supporting her work as education coordinator and her personal interest in the bees. She regularly brings groups of people to visit it during the tours of the farm that she leads, particularly school groups. She feels a sense of responsibility to make sure that it is working, and so she regularly checks that it is. But it has also become a resource for her personal interest in the bees, and she uses it for reassurance that they are OK, before and after each time she opens up the beehive.

At least once a week I go there, sometimes more. I go there also to check that it's working. I go there before I go and check the bees and after I go and check the bees, just because I'm interested to know how disruptive it is for them to be checked on. And just to try and discern different sounds. It's quite interesting.

The Bug Hotel has also been appropriated by the wider farm management to support its work, as demonstrated in Figure 67. The flyer shows a photo of the Bug Hotel, a visually striking icon used to advertise the farm in publicity and marketing materials.

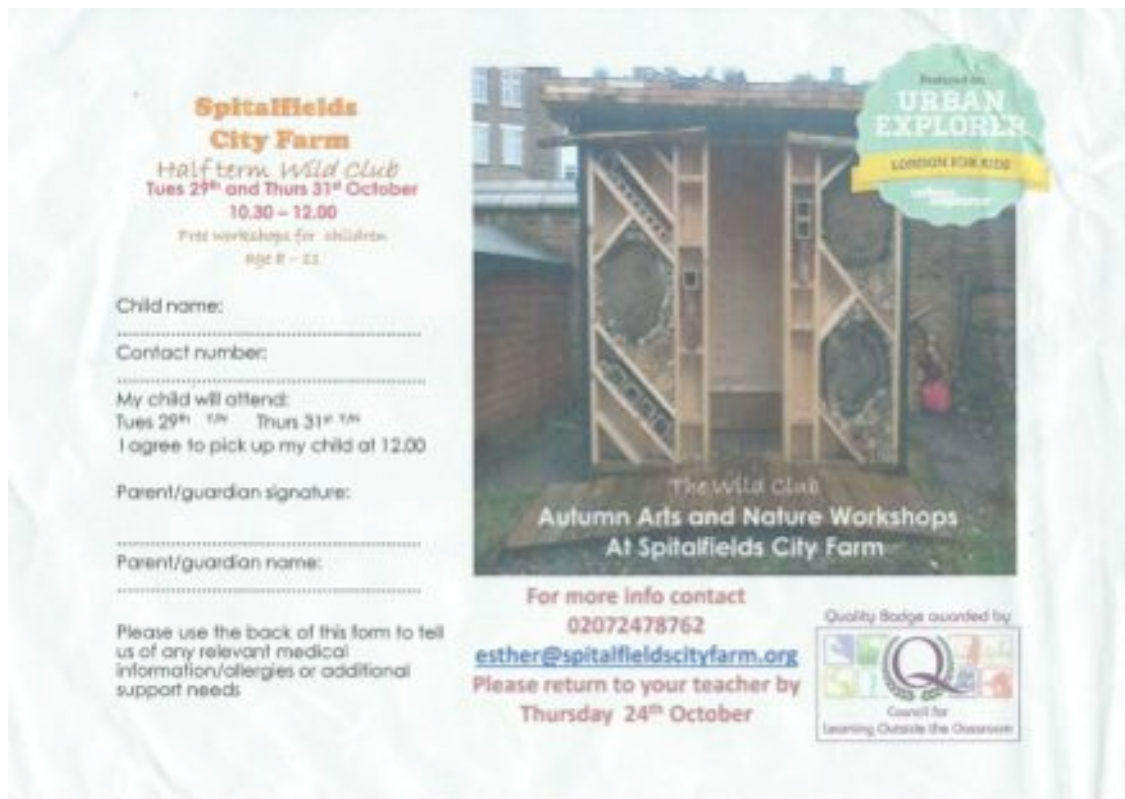


Figure 67: Flyer used by the farm for educational activities for children, showing how the Bug Hotel is being appropriated by the farm and incorporated into the everyday activities of the farm

Signs that the general farm community was appropriating the Bug Hotel include the ways in which children, especially, were observed taking great pleasure removing the materials from the cavities of the Bug Hotel – these same materials may have provided a habitat for small creatures. Others enjoyed filling the holes intended for insects with sticks, effectively preventing insects from inhabiting these holes.

Much later than the evaluation time frame (i.e. almost two years after the completion of the Bug Hotel, and a couple of weeks before submitting this thesis) there were also signs that the Bug Hotel was beginning to be appropriated and used by non-human species. I visited the farm and Esther showed me how the Bug Hotel was beginning to be populated by wild solitary bees called leafcutter bees. The bees had laid their eggs in the holes of the

large cross section of wood at the front of the Bug Hotel, and then covered the eggs with leaves (Figure 68). A spider had taken up residence inside the cupboard that housed the electronics.



Figure 68: Detail of leafcutter bee eggs

While I understood all these signs of appropriation by different species as a measure of success, because they suggested that there was benefit to both humans and insects, it became apparent that the attempts at appropriation by different sections of the community could come into conflict. One of the ways we described the Bug Hotel was as an experiment in interspecies cooperation. It was intended to serve both bugs and humans: for bugs it was to provide a habitat for hibernation and a place to lay eggs, for humans, a space for contemplation, reflection and play. Yet these needs were in conflict with each other. So it was exactly this desire to encourage humans to interact and play with the Bug Hotel that, it seems, was incompatible with the desire to provide for the needs of other species. And paradoxically, at the same time we were hoping to cause a shift in (human) perspective to one of

accommodating, learning about, and respecting other species, within the greater aims of promoting environmental sustainability. Esther reflected on this tension:

I think that some of the actual habitat for bugs bit is sacrificed for the other bits. And to my mind I think that's OK. But yeah it is quite an interesting tension. And I think there's a need for some of [the Bug Hotel] to stay intact but it's great that people play with it and use it I guess it could be viewed that it loses something in that ... it loses some literal habitat, but to my mind it gains in other ways.

While the immediate design is to provide a habitat for bugs, perhaps the ultimate long-term goal is to provide a shift in perspective in humans, towards a consideration of other species, which will contribute to a more sustainable society and future.

While I took all these signs of appropriation by both human and insect species as a measure of success of the Bug Hotel, I acknowledge the limitations of evaluating the project over a relatively short time span. In order to adequately evaluate the benefit to non-human species, researchers may need to consider evaluating over longer time frames. For example, insects may take up residence and build colonies inside the Bug Hotel, but this would occur over a matter of months or years (as we saw in the case of the leafcutter bees). This raises the question of how hearing these live colonies would change the human users' appreciation and understanding of the project. Evaluating the Bug Hotel in different weather and in different seasons would likewise require a longer time frame. It would be interesting to see how the live feed from the beehive sounds in winter compare to those in summer, and how Esther's particular use of the Bug Hotel changes throughout the seasons and changing weather patterns. Taking a longer view of evaluation may allow for an evolution of appreciation, as it did of the Indoor Weather Stations, which was *"both intermittent and slow ... not just because the devices take time to*

understand and reflect upon, but because their subject, the environment within and around the home, itself evolves slowly” (Gaver et al. 2013).

Finding the sweet spot

In the Indoor Weather Stations, Gaver et al. (2013) describe their aims of finding a “*sweet spot between banality and incomprehensibility. Provocation requires a level of defamiliarization, but this fails if devices are either too familiar, or too alien*”. This challenge of finding the sweet spot also arose in the design of the Bug Hotel. Inspired by the philosophy and examples of slow technology (Hallnäs & Redström 2001), I had expected the Bug Hotel to be a space of contemplation, where people would be content to wait for the bugs to come, or to listen to the raindrops on the gutter, or to take action and play the Bug Hotel as a musical instrument. The initial sound design attempted to incorporate ambiguity as a resource for reflection and personal meaning-making. However, this initial design clearly missed the sweet spot because it leaned too much towards incomprehensibility: people would go into the Bug Hotel, put the headphones on, not hear anything, and then leave. While I did observe a few instances of people reading the instructions and then playing the Bug Hotel as a musical instrument, this was certainly the exception to the rule. Gaver et al. (2003) highlight the challenges of employing ambiguity and missing the sweet spot if the system is too incomprehensible: “*Many ambiguous systems are merely confusing, frustrating, or meaningless*”, words which indeed could be used to describe the Bug Hotel in its first iteration. Esther pointed out the flaws in the original design:

I’m not sure the idea works in practice. We knew it was experimental about what we would hear. What makes it tricky is, how do you know if you’re not using it properly, or it’s broken, or there’s nothing to hear.

She went on to explain:

Once it was up and running ... the impression that anybody would get is that, oh it doesn't work. Which is different from not being patient enough to wait for [the bugs] because ... perhaps they're right, perhaps there isn't anything to listen to.

Judging by the amount of interest and the time people spent interacting with the Bug Hotel, and Esther's comments, once we introduced the pre-recorded sounds and the audio feed from the beehive was working it seemed that we did manage to hit the sweet spot. Esther's first report to me via email a couple of days after I finished installing the new version was: "*Bug Hotel mics have been a BIG hit – lots more interest*". She thought that in the end we had reached a balance between reflection and entertainment – "*in the end there's a bit of a compromise because there's both in there*" – suggesting that we had reached the sweet spot between incomprehensibility and banality.

Adding value to the farm

The findings indicate that the Bug Hotel adds value to the work that the farm does through supporting the core value of **sustainability**; by helping to make the farm a more **cohesive place**; and by providing opportunities for **participation**, which contributes to the core value of **community**.

Supporting sustainability

The Bug Hotel helps strengthen the sustainability work the farm does in different ways and on different levels. It first of all directly provides food and habitats for insects, thereby supporting beneficial pollinators and the wider ecosystem of the farm. "*You can look at it very closely and very directly and see a roof garden that literally provides some food for [insects]*". But more importantly, it opens new spaces for reflection about our relationship with other species and the place of humans in that ecosystem:

I think it's just a way of tuning in ... creating a different lens, a new perspective on the world, the world of bugs perhaps, and my place in it when I'm sitting listening to it, or creating a space for them.

This echoes Gaver (2002) when he says that ludic designs

may be pleasurable to experience, but it should be clear that they go beyond mere entertainment They raise these issues, but don't provide answers. Instead, they offer ways for people to experience life from new perspectives, thereby testing hypotheses about who we might be or what we might care about.

Rather than achieving this shift in perspective through top-down, authoritarian, utilitarian and technology-led solutions, the Bug Hotel uses playfulness to support a sense of discovery and self-motivated exploration. This is in keeping with the way that way that sustainability is understood at the farm.

While there was room for educational activities, the Bug Hotel provides a playful rather than didactic experience.

I get anxious sometimes that I'm not, I don't do enough formal educational statements, learning. And I think there is room for more of that, including in the use of the Bug Hotel. But I also think that one of the real strengths of the farm is the experience of being here and exploring, and that it is quite self-exploring, so there's a potential to discover for yourself. So playfulness in the widest kind of sense of it is stimulating, isn't it [Playfulness] can be a reaction against sort of strongly taught didactic messages as well I think that's another thing about the Bug Hotel. It is so multisensory as well, which is part of the playful aspect.

The Bug Hotel works by encouraging people to acknowledge that the space is shared with other species, and by promoting the active care of those species. In this way, the Bug Hotel does the indirect educational work of trying to shift

perspectives and open up new possibilities for sustainability. Esther reflected on the direct educational work that the Bug Hotel does: *“It’s directly educational about invertebrates and so on and there’s more to be made of that still”*. But, more than that, Esther acknowledged that it has a less directly educational purpose, through the way it encourages *“thinking about the space as ... used in different ways, or as a space for different creatures”*. During the school tours, Esther uses the Bug Hotel as a way to explore the idea of habitats and homes and taking care of other species, thereby contributing to the value of sustainability at the farm as articulated in Chapter 4.

Making the farm more cohesive

During the consultation, ideas floated around about how the Bug Hotel could help to make the farm a more cohesive space. For example, one idea that arose was for a trail or map through the farm. Visitors could pick up a printed map that would take them to the different points of interest, including the Bug Hotel. While the map trail still hasn’t happened, the Bug Hotel is being used on tours of the farm, and does link up to the more overtly educational content in the eco-station (a cabin that has books, activities, insect specimens and magnifying glasses, and where Esther often takes school groups for more formal learning activities). Esther describes how it helps make links by being used

as a way of pointing out other things of the farm, so for example all the flowers or the wildlife area. To link to other stuff that’s around in the farm, to make more of the other stuff that’s here.

Another way that it has contributed to making the farm more cohesive is through signage (Figure 69), which was identified as a weakness at the farm in Chapter 4.

[Signage] is another thing that the Bug Hotel has done. It is helping us, even though so slowly, to get signs and information around the place.

And it's kind of, because there's a microphone inside the Bug Hotel that I want people to listen to, then people need to know about where the beehive is, otherwise they're confused and they think the beehive is in the Bug Hotel and things like that. So it's helped us make sure that we're pointing out other things.

Finally, the Bug Hotel is helping to make the farm more cohesive by changing and contributing to the experience of space.

It's part of making the space around there The visual statement aspect of it has helped make an area that is still happening. I think that's quite important ... so for example if I'm with a tour of pupils there isn't much time on the tour to actually directly explore the Bug Hotel but it features as part of it. And then the class will go and use it later after the tour. So it's kind of used within those programmes. But I think it's also a place that people go to, and have a little sit around there and have a fiddle with it. So it's helped add to the shape of the farm.



Figure 69: The Bug Hotel is becoming part of the tour of the farm, integrated into the farm and all its permanent fixtures and attractions, prompting the farm to become more cohesive

Contributing to an active notion of community

By providing many opportunities for diverse members of the community to participate in enjoyable and inclusive activities, the Bug Hotel has contributed to the core value of community as conceptualised in Chapter 4. As discussed previously, this conceptualisation contributes to an active notion of community (Nancy 1991) as constituted through activity in shared time and place. For example, the consultation was a festive event that included refreshments and at which everyone was invited to take part in conversations, to interact with different materials, and to contribute their opinions and ideas. Esther agreed, saying: *“I felt that it had a bit of an event feel about it. It was nicely done”*. And it included everyone from staff to regular volunteers, corporate volunteers, families and people who were visiting the farm for the first time.

Chapter 4 highlighted that communication at the farm is a challenge, and that staff don't know a lot about what is going on in each other's areas. The consultation event helped to improve communication and learning about the different projects and activities, and generated new ideas for linking them together.

There were ideas for [the Bug Hotel], that ... seemed to be a catalyst for other people's ideas about other areas [of the farm] ... and also through it I learnt a bit more about other people's kind of work in other areas of the farm that I hadn't really known about so much. So it was useful in that way.

The consultation provided an effective way of informing staff and volunteers about the plans for a Bug Hotel. It was also a way to have their opinions and input heard and valued. Finally, it helped generate enthusiasm and interest. As Esther explained:

I think it's important to see what ... other people think about the idea really, and to get lots of ideas. I think it's quite helpful to see what other staff thought and to get their input into it ... I think also there's just always so much changing and building and going on here that it's helpful to make sure people know So I think that it was important in that way.

Like the consultation, the actual physical build of the Bug Hotel over the course of a couple of months was the type of event that allowed for diverse sections of the community to participate. Esther reflected: “*For everyone coming to the farm it was like, ‘oh something exciting is happening here’. And then sometimes people were able to get involved The building of it itself was ... like an event*”.

Over a hundred volunteers contributed their labour, as did schoolchildren who helped to fill the cavities with different materials. Esther reflected on the ways in which people were involved:

When it was being created we tried to involve lots of people in it. And that did happen both kind of formally through groups – “Come here, today you are working on the Bug Hotel” – and also quite randomly, leaving piles of sticks there and people coming and doing that [filling the cavities]. So I think there were nice aspects of that from the building of it.

By allowing diverse members of the community to participate in events and in the building of the Bug Hotel, thereby providing opportunities to learn about other areas of activity at the farm, the project has contributed to community engagement and cohesion. These aspects of the research highlight the valuing of process within the participatory methodology as much as the designed outcome (Robertson & Simonsen 2012). Furthermore, these events provided opportunities for varied people to have their voices heard through engagement with non-technical and often non-verbal means (Bannon & Ehn 2012) and create rich materials that can serve as inspiration for future designs.

Community-based Participatory Design

I will now describe in greater detail findings that I constructed from the thematic analysis relating to the community-based Participatory Design process. These are organised into the following two themes: *Who benefits and initiates?* and *Flexible and culturally appropriate ways of engaging the community.*

Who benefits and initiates?

Vines et al. (2013) raise questions about the ways in which participation is configured in HCI, and call for greater reflection around who initiates and benefits from the research. In the previous research through design case study I questioned the “*genuine*” participation (Robertson & Simonsen 2012) of the Talking Plants project, because, while the farm may have benefited

from the project, they neither initiated nor owned it (Pelling 2007; Akama & Ivanka 2010) and their involvement was limited. The Bug Hotel was further developed in that it was to a large extent initiated by the community, and to this day it is owned and installed permanently, and forms an integral part of the farm.

In terms of personal benefit, both Esther and I found working together to be a very enjoyable experience. Furthermore, I benefited because in Esther I had found a collaborator with whom I could work, and that had been lacking previously. I had tried to present myself to the farm as a resource, right from the start. I was therefore happy when Esther approached me in 2012 to see if we could collaborate. In my field notes I reflected:

We had a good long chat, and I was thinking to myself, finally, this is the kind of chat I'd been trying to have for ages. Someone from the farm staff seeking me out for collaboration, for something that they could actually use. (blog entry)

Esther reflected on how she benefited from the collaboration because it provided her with the opportunity to realise her ideas in a way that she would not otherwise be able to:

It was really quite exciting actually, just to chat through some ideas and then have something actually amazingly come from it. It was great ... I feel like I've often got ideas for things that could be great and not so much ability or remit to go ahead and do them and suddenly ... it just kind of came together. It was amazing. Amazing.

Esther also really enjoyed getting her hands dirty and helping to build the Bug Hotel.

I really liked it. I could get involved in ... making the roof garden. My favourite bit was up on a ladder with my hands in the dirt. Things like that I enjoyed. And again, playing around, trying out some of the

colours, and seeing where you were putting microphones and how it was inside it.

Dialogical encounters and mutual learning contributed to the mutual benefit experienced by the farm and myself more generally. Through meetings, the consultation, discussions, and the building of the Bug Hotel, all those who were involved were trying to understand one another's points of view, our differing needs and desires, and how we could best contribute towards what we wanted to create. "*The designer and the user are both changing the situation (as a form of inquiry) in order to learn from it and understand how to go on*" (Wright & McCarthy 2010, p.69).

It was important that I did not come to the community as some expert who thinks she knows it all and impose my ideas on others. Rather, I tried to acknowledge that the members of this community were experts of their own experience of the farm. The mutual learning that is part of this dialogical perspective meant that we would work towards greater understanding in collective "*reflection-in-action*" (Schön 1983; Robertson & Simonsen 2012). As Esther described, "*I had some ideas and you took them in a new direction, and you had ... ideas, and we looked at how they could work at the farm*". Through the consultation, community members contributed their expertise, whether that was the kids and families who used the space surrounding the site and offered their opinions on how it would affect their play, or the staff that could see how the Bug Hotel could contribute to building a more cohesive farm. I see Esther's comment as a sign of "*genuine*" participation, which Robertson and Simonsen (2012) refer to as "*the fundamental transcendence of the users' role from being merely informants to being legitimate and acknowledged participants in the design process Inviting users to such collective discussions and reflections requires a trustful and confiding relationship between all participants*". It was the two-year process of embedding myself in the community and making myself available to it that

paid off in terms of building the trustful and confiding relationship with Esther that allowed for the “genuine” participation to occur.

However, on reflection I realise that this genuine participation was limited to a single person – Esther – and that the project was initiated and evaluated primarily by Esther and without the involvement of other staff or volunteers. This means that I cannot say with any certainty what the other staff or volunteers really thought of the Bug Hotel. It is possible that it was a pet project of Esther’s and that others resented it. I do not know because the others were not truly involved.

In fact, at the consultation one staff member suggested that we move the focus away from bugs to include birds, and to change the name from “Bug Hotel” to “Wildlife Hotel” to incorporate other animals. There was also a suggestion that we have the bee-listening station closer to the beehive, rather than in the Bug Hotel, and to keep the bugs and the bees separate. Esther and I did not agree with these suggestions. We decided to keep the name Bug Hotel, and to keep the bee listening station inside the Bug Hotel. On reflection, I acknowledge the possibility that these other voices were silenced, certain views were not taken into account, and that this may have resulted in feelings of disempowerment (Kensing & Blomberg 1998a; Bentley et al. 1992; Hughes et al. 1992).

Flexible and culturally appropriate ways of engaging the community

The Bug Hotel study helped to reinforce the findings from Chapters 4 and 5 that a flexible approach to engaging the community in design processes is often a more effective way to get things done than more rigid planning of structures for participation.

Working on the Bug Hotel highlighted that things happen at the farm organically. Often it was through informal conversations and serendipitous encounters that the project moved forwards. It was by virtue of spending time

at the farm, by showing my face and being physically present, and by taking an active stance to present myself as accessible and open and as a resource to the farm on which the community could call that significant developments were made. For example, in June 2012 I was at the farm for a meeting with Olivia and Mandy about the Talking Plants. Esther saw me sitting outside at a table and approached me. She told me about her idea for a Bug Hotel, and showed me a site at the farm where she thought it could be located. We talked about how it could incorporate the bee-listening station. In our final interview she reflected on how ideas would evolve through these conversations: *“It was quite surprising how just from having conversations then it would spark ideas”*. This way of making myself available by being physically present and open seemed more culturally appropriate to the farm than running a series of more formal workshops.

Flexibility was essential, not only for finding participants and for moving the collaborations forward, but also for improving the design. For example, although it seemed like a good idea in the initial iteration of the Bug Hotel to have the sound only coming from microphones inside the structure, so that people could play it as an interactive sound sculpture (or wait for insects to take up residence), this didn't actually work in practice because most people thought that the system was broken. Responding flexibly to the needs of the farm meant that the design was refined in collaboration with Esther. She reflected on this process:

It has been important that the things work. And for me that has been a gradual realisation actually. And maybe helpfully prompted actually by you asking “how are people using it?” And that really making me realise, well, what I'm seeing is people put their headphones on and then saying “Oh, it doesn't work”, even when it did work, but you would hear nothing. So I think that was actually really successful how we looked at what we put in it and then thought there could be a better

way for it to be So there wasn't a problem with changing the original plan for it. I think that flexibility has been really important to it.

At the same time, relying on a flexible approach, in which I did not know where things were leading, and relying on things evolving organically, meant that it was very difficult to plan and manage the time it would take to do things.

Privileging flexibility and culturally appropriate forms of engagement over more rigid plans meant that we were not able to do all the things that we had wanted to do within the time constraints, and the project seemed to turn into a never-ending process. Through conversations and the consultation we generated many ideas for extending and improving the Bug Hotel. For example, one idea was for a Bug Hotel website where clicking on the image of the Bug Hotel triggers pop-ups of bug habitat images and insect sound files. Another idea was to create a TripAdvisor listing for the Bug Hotel, where people could leave feedback about their visit.

Esther also had plans for improving the educational aspects of the project and expressed disappointment at not having been able to do more:

I suppose I've had a sense since we've stopped more directly working together, oh, I could always be, should always be doing a bit more. There's a lot more that could go into it in terms of pictures and information, or developing the area around it. It's kind of ongoing and slow. I'm conscious of that.

At other times, Esther was accepting of what we did not manage to achieve, and saw the ideas that we generated as valuable in terms of the inspiration they offered. *"It is actually nice to think there are more possibilities even if they can't be realised. And I think this is the kind of thing that users can be inspired to think about, can't they. That's nice"*. It was never possible to realise all the many ideas that arose, particularly in the consultation. Furthermore, I acknowledge that, because they weren't taken into account, those who

offered their suggestions may have felt that their voices were unimportant to the project.

One of the pitfalls of staying too open and not planning adequately is that researchers become “*yet another temporary resource taking on the role of the consultant who builds something, leaving behind a system that is difficult to use, fix, and modify*” (Merkel et al. 2004). In the case of the Bug Hotel, this is indeed what has happened. One year on from finishing the Bug Hotel, the technological elements have stopped working. This is the risk of building something that is owned by the community, rather than the designer, and of not adequately planning for its ongoing maintenance.

Conclusion

In this chapter I have presented the second of two research through design case studies, the development of the Bug Hotel, an interactive sound sculpture that is installed at the farm, and was a collaboration between myself, Esther, a commissioned artist, and the wider farm community. The aims of the study were to build on the community-based Participatory Design methodology developed in Chapters 4 and 5, by exploring what happens when a project is initiated and owned by the community, and by configuring (Vines et al. 2013) a more “*genuine participation*” (Robertson & Simonsen 2012) than that described in the Talking Plants study. This methodological goal was coupled with a focus of building on the themes of the Talking Plants – namely, of providing playful and reflective experiences with hidden, overlooked elements of the farm, and exploring how this may contribute non-utilitarian understandings of sustainability and thereby expand the design space of HCI.

The findings highlighted how sound was an important element of the multisensory experience: it drew people in, kept them engaged, brought them back, provoked conversations, and directly supported Esther’s work with the

bees. Furthermore, by giving people access to the bees and other insects that are usually hidden and overlooked, the sound allowed for new perspectives on the environment. The findings indicate how the project has contributed to sustainability by literally providing a habitat to pollinating insects, through education, and by providing space for reflection and self-motivated exploration of our place in the world in relation to other species. By describing the opportunities for participation provided by the consultation event and the build of the structure, as well as the ways in which it is beginning to be appropriated by the farm community, I gave evidence of how the Bug Hotel has supported the farm by helping it become more cohesive and contributing to an active notion of community as it is articulated at the farm.

The methodological finding that flexibility is necessary for working with the community reinforces the findings from the previous two studies. However, inadequate planning resulted in a failure to implement all the ideas that we wanted to, and left a system that was not adequately robust or maintained. Furthermore, the evaluation was limited because it was conducted over a very short timescale and relied mainly on Esther's experiences and observations. By focusing primarily on the collaboration, experience and observations of a single individual, I acknowledge that I may have sidelined other staff and volunteers, who may have felt disempowered or silenced.

In the next chapter, I draw conclusions from this research by discussing it alongside the findings from the previous two studies (Chapters 4 and 5), and by presenting my reflections, which include strategies and challenges for doing similar kinds of work.

Chapter 7 – Conclusions

Introduction

This thesis aimed to widen the design space of sustainable HCI by investigating new approaches to disrupting the dominant narrative of efficiency and productivity, and including non-“expert”-led voices in the discussion about what sustainability means and how such understandings can influence the design space. In order to address this research aim, I asked the following question: **How can the design space of sustainable HCI be expanded through a community-based Participatory Design methodology with a ludic focus, in the context of an urban agricultural community?**

This research question brought up the additional research questions:

1. How can ludic encounters be designed to support the farm and potentially others with similar values?
2. What understandings of sustainability does this approach elicit, and how do they differ from those based on a discourse of sustainable consumption?
3. What are the challenges and opportunities of community-based Participatory Design when working with diverse and non-settled communities such as Spitalfields City Farm?
4. What methods are culturally sensitive and appropriate to inclusive engagement of the community?

I have attempted to address the research aim and answer the above questions through three years of research conducted with Spitalfields City Farm. I have based my methodology mainly on community-based Participatory Design, with a ludic focus, to support the community. The first

step was to conduct an exploratory field study that aimed to build relationships, and understand the values, needs and practices of the farm (Chapter 4). This was followed by two research through design case studies (Chapters 5 and 6) that built on the findings and recommendations elicited from the exploratory study. The first of these was the Talking Plants, a ludic encounter with edible plants that aimed to support the educational and community engagement work of the farm. The second was the Bug Hotel, an interactive, permanently installed, large sculptural object that provides a habitat for beneficial insects and a space for humans to rest and play. The studies were grounded in community-based Participatory Design and drew on the non-utilitarian principles of ludic design to open up new perspectives on sustainability, encourage reflection, playful explorations and multiple interpretations, and support the values of the farm.

As described in Chapter 3, bringing together Participatory Design and ludic design allowed me to overcome some of the limitations of each on its own: a focus on ludic encounters allowed me to add a more playful, non-utilitarian focus than would typically be found within traditional Participatory Design; while Participatory Design has allowed me to ground the ludic encounters in the needs, values and practices of the community.

I conducted the research with an urban agricultural community because it offered opportunities for answering the calls within sustainable HCI to shift the focus from consumption to production (DiSalvo et al. 2010), from individuals to collective action, citizenship and community (Baumer & Silberman 2011; Hirsch et al. 2010), and from competition to cooperation (Dourish 2010). It also presented an opportunity to examine the critical interrelations between the social, environmental and economic factors that impact on sustainability (Odom 2010; Hirsch 2014).

In this final chapter I present a set of final reflections on the research. I begin with two sections that consolodate the new approaches that I have developed throughout this PhD. The first is a manifesto for community-based sustainable

HCI; the second is a consolidation of my Ludic Participatory Design methodology. This is followed by a set of strategies and challenges for others wishing to do similar kinds of work with similar kinds of communities. I conclude the thesis with final words and a discussion of future work.

It is important to note that the strategies described below are to serve as guidance only for other researchers. While urban and community agriculture allows us to broaden our understandings of sustainability, such communities are highly localised and therefore the ways in which sustainability is conceived are highly dependent on local context (Feenstra 1997; Hirsch 2014). Research through design in general, and community-based Participatory Design in particular, teaches us that every situation is different and what is learned has to be creatively localised to new situations (Clarke 2014). It is not possible to generalise approaches or theories from research through design. Rather their role is limited to inspiration (Gaver et al. 1999) and they must be transferred and adapted to each new situation.

Manifesto for Community-based sustainable HCI

In this section I consolidate and explain my manifesto for an alternative understanding of sustainability within HCI that I call *community-based sustainable HCI*. Within this vision, sustainability and community are understood as mutually constituted, and the wellbeing of the community and the environment are inseparable. Sustainability is not about rationalising consumption practices, personal sacrifices, competition for resources or exercising alleged citizen-consumer power (Hobson, 2002). Rather, it is premised on the idea that by taking care of ourselves and other species, we can create 'spaces of hope' (ibid) where there is enough for all, and creativity and enjoyment flourish. Here, environmental sustainability is not privileged over, or separate from, the social. For example, within the community farm, as much emphasis is put on the social benefits of gardening together as on the

environmental, with the aim of increasing the wellbeing to individuals, communities and the Earth. I believe that this approach to sustainable HCI has the potential to contribute to greater social inclusion, urban sustainability and healthier local economies.

Community-based sustainable HCI recognises that community is sustained and made resilient through gift exchange, mutual care, collective action, cooperation and education. Capacity is built by strengthening skills and knowledge within nearby communities, which in turn has the potential for scaling up the impact on the wider society and on the environment. Financial and social aspects of sustainability are addressed by helping to increase the community's user base (thereby increasing volunteer labour upon which CBOs rely) and keeping its constituent sub-communities involved.

Fundamental to this understanding of sustainability is the recognition that humans are in a web of relations, and not at the centre. Wellbeing for the community and the environment necessarily takes into account the wellbeing of non-human species, and therefore indicates a nonanthropocentric worldview, which I discuss in greater detail below. If we extend our empathy to animals and plants then we will have a different world.

Within community-based sustainable HCI, the notion of community is an active one. Community is dynamic, bringing people together in shared activities, rather than a totalising, static, homogenous entity that silences difference. It embraces and responds to change and values inclusiveness, diversity and participation.

Community-based sustainable HCI allows us to examine our roles as producers and consumers as well as our cultural assumptions (such as the notion that food growing should be separated from everyday urban activities). It allows us to shift the focus from consumption to production (DiSalvo et al. 2010), from individuals to collective action (Ganglbauer et al. 2013; Boucher et al. 2012), citizenship and community (Baumer & Silberman 2011; Hirsch et al. 2010), and from competition to cooperation (Dourish 2010). For example,

focusing this PhD research at Spitalfields City Farm has highlighted the ways in which the community control their own food production and supply, rather than placing it in the hands of corporations and market demands. Drawing awareness to food sovereignty addresses providence as well as wider concerns about ecological and social justice.

As I have demonstrated through the case studies, community-based sustainable HCI supports community resilience, engagement and cohesion by providing opportunities for diverse members of the community to participate in inclusive activities. Rather than needing to persuade people to make sacrifices, become more efficient or productive, interventions with technology are celebratory, pleasurable and joyful experiences that enhance and augment the existing practices of the community. They contribute to educational activities, as well as support collaborative knowledge sharing and production. Such interventions strengthen the links between education, wellbeing, the environment and the community. They also provoke reflection and open up new perspectives on our practices of consumption and production, on our place in relation to other species and the limits of what we might care for.

What are the broader implications for future work within community-based sustainable HCI? It is not our job to convince others to become more sustainable or to tell others how to do it. Rather it is to identify communities that are already doing things differently, and to strengthen the work that they already do. For example, perhaps we have identified a community that is interested in energy sovereignty and who want to set up a wind turbine. A traditional sustainable HCI approach might be to help the community become more efficient and productive in terms of its energy output. In contrast, a community-based sustainable HCI approach would aim to support the links between education, community, energy, the environment, wellbeing, and financial sustainability of that community. The process and outcomes would celebrate the community, aiding its outreach and communication. Rather than

approaching the community from a human-centric position, it would also take into account other species. For example, it may try to incorporate benefits to other species, or at the least to provoke new perspectives on how the wind turbine impacts on the ecology of the region and biodiversity. By valuing the process and not just the outcome, design work in this space creates opportunities for diverse members of the community to participate in inclusive events. It is not just about a product, but it is also about designing processes and relations.

To help frame these broader implications, community-based sustainable HCI relates to what Manzini (2007) and Meroni (2007) have written about design for Creative Communities:

To foster the transition towards sustainability we must look beyond mainstream positions, behaviour and opinions and know how to recognise, in the complexity of signals that society sends us, those that are most promising. In other words, those emitted by certain minorities who have been able to set up on a local scale radical innovations in ways of being and doing things. Once identified we must foster them and facilitate their diffusion. [Such sites] are all radical innovations of local systems, i.e. discontinuities with regard to a given context, in the sense that they challenge traditional ways of doing things and introduce a set of new, very different (and intrinsically more sustainable) ones: organising advanced systems of sharing space and equipment in places where individual use normally prevails; recovering the quality of healthy biological foods in areas where it is considered normal to ingest other types of produce; developing systems of participative services in localities where these services are usually provided with absolute passivity on the part of users, etc. (Manzini, 2007)

To summarise, in order to broaden the domain of sustainable HCI beyond a behaviour change approach based on a discourse of sustainable

consumption, I have presented an alternative model which I call community-based sustainable HCI. In this version of sustainability, the wellbeing of the community and the environment are inseparable, the community extends to other non-human species with whom we share resources and space, and the idea of community is dynamic and inclusive. By identifying sites where radical innovation is already taking place, the task of the designer is to help strengthen the links between education, wellbeing, the environment and the community. In this way, community-based sustainable HCI allows us to challenge narratives that no longer serve the wellbeing of our communities or our planet.

Ludic Participatory Design

I now come to a consolidation of the new methodology that I have developed within this PhD, a methodology that will serve others wishing to conduct research and design in the context of community-based sustainable HCI. I call this methodology Ludic Participatory Design. Throughout the thesis I have demonstrated that Ludic Participatory Design is an effective way for doing community-based sustainable HCI because it provides opportunities for enjoyable, playful, celebratory encounters that are grounded in the needs, values and practices of the community. This approach contributes to community-building, education, and cultural production by providing opportunities for diverse members of community-based organisations to participate in different ways in inclusive events. It also asks who gets to participate, and, by taking a nonanthropocentric approach, it considers other species that may be part of the community, and in this way provokes reflection on our place in relation to other species. It extends the definition of participation to other species.

Ludic Participatory Design provides an effective way to create opportunities for meaningful and relevant encounters with technology and to help

strengthen the links between the community, education, wellbeing and sustainability. It does this in two distinct ways. Firstly, it draws on the democratic, egalitarian values of Participatory Design as a way to include more voices in the debate of what sustainability means, and to include those who will be affected by the design in the design process. In this way it seeks to include definitions that are not expert-led, top-down or authoritarian. Including bottom-up and grassroots understandings of sustainability allows for designs to become meaningful and relevant for those who will be affected by the designs (and thereby helps overcome the alienation of much persuasive sustainability (Hobson 2002; Strengers 2008). Secondly, by drawing on non-utilitarian principles of ludic design, Ludic Participatory Design employs reflection and ambiguity over clear narratives of use as a way for non-utilitarian discourses of sustainability to enter the design space. In this way it provides opportunities for diverse and personal meaning-making, appropriation, and pleasurable experiences rather than efficient solutions to task based problems. As above, this in turn allows for design outcomes to have more relevance to those who use them and can begin to address the aforementioned alienation and lack of relevance to users of traditional individual behaviour change designs within sustainable HCI.

Ludic Participatory Design allows for dialogical encounters, where the research is a process that unfolds over time and is influenced by relationships, perspectives and experiences that all parties involved in the research (including the researcher) bring to the study. It is effective within a community-based sustainable HCI context as it values both the process and the outcomes. It values the knowledge and experiences of the community, rather than relying on the beliefs, assumptions and agendas of designers.

Ludic Participatory Design draws from both ludic and Participatory Design, but does not rigidly adhere to either. Both the ludic and Participatory Design need to be changed in order to make them work within the context of community-based sustainable HCI.

Ludic design gets changed in the following way. While traditional ludic design has created generic designs batch deployed to multiple communities, Ludic Participatory Design generates bespoke solutions grounded in the values, needs and practices of local contexts.

Participatory Design gets changed in the following way. Within Ludic Participatory Design participation becomes more nuanced and diverse than would be acceptable within traditional Participatory Design. Ludic Participatory Design does not dictate a single valid way to participate. Examples of valid forms of participation from this PhD research include: 1) the farm manager giving her blessing to conduct the research; 2) staff helping to steer the development of design ideas (even if they didn't experience the outcome); 3) families and other visitors attending events such as the Bug Hotel consultation; 4) corporate volunteers donating their labour for the Bug Hotel construction. All of these ways of participating tap into the existing values, concerns and practices of the community. If we want to work with CBOs then we need an open and flexible understanding of participation, rather than a very rigid understanding.

To summarise, Ludic Participatory Design is an effective way for doing community-based sustainable HCI. By designing enjoyable, celebratory encounters that are grounded in the needs, values and practices of the community, it supports capacity building, inclusive participation and communication, thereby strengthening the links between wellbeing, education and the community. By valuing both the design process and the outcomes, it allows for dialogical and participative encounters that develop through the relationships and subjective experiences of all participants. Broader implications for this methodology is that it may prove to be an effective way to conduct research within other contexts and matters of concern (DiSalvo et al., 2014) such as design for and with communities often excluded from discourses of technology (e.g. the aged, immigrants, or disabled), development and the global south, and activist communities.

In these two sections I have presented a manifesto for conducting community-based sustainable HCI through a Ludic Participatory Design methodology. In the following sections I describe further strategies and challenges for doing this kind of work, as drawn from my reflections of conducting this PhD research.

Reflections, strategies and challenges

In this section I draw on the findings from the case studies, as well as the opportunities and implications for design from Chapter 4. In examining the studies alongside each other, together with the literature, I have distilled some final reflections that include strategies and challenges for designing ludic encounters through a community-based Participatory Design methodology to support values that are essential for sustainable HCI and help make them more robust.

Inclusive design

Inclusivity was identified as one of the core values that contribute to conceptualisations of community at the farm. Therefore, in order to design ludic encounters to support the farm (**questions 1, 3 and 4**), I have tried to consider the best ways of not excluding large sections of the community. As Le Dantec and Edwards claim, efforts in urban computing may be inherently exclusive as they do not engage the breadth of social diversity (Le Dantec 2008). As described in Chapter 4, mobile-phone computing (including apps and QR codes) may be exclusive when considering people's age, ability, technical proficiency, and language, as well as preferences to not own a smartphone or other mobile device or carry one around when engaging in gardening activities. Furthermore, screen-based technology may be inappropriate as it compromises face-to-face connection.

Both the Talking Plants and the Bug Hotel studies suggest that a more inclusive approach to designing smartphone apps is to design interventions into public fixtures of the environment, or to embed interactive technologies in everyday objects, and to design these in such a way that all sectors of the population can interact regardless of age, language or technical ability. For example, with the Talking Plants case study, hiding the technological components inside the everyday object of the watering can resulted in the technology being non-threatening and intuitive to those who had little experience of using interactive devices. It allowed for people of diverse ability, age and language to interact with it, without the need for prior technical experience or ownership of mobile phones. Similarly, in its final iteration, the Bug Hotel was available to all, intuitive, and easy to use. Making the systems robust and with no trailing wires may also help to make interactive systems non-threatening.

Furthermore, the case studies suggest that, rather than designing new experiences with new devices (such as mobile phone apps) or trying to make existing practices more efficient (such as directly augmenting gardening practices with automation systems), leveraging existing practices and experiences (e.g., watering, caring for and learning about plants) and familiar objects (e.g., watering cans and plants) may be a better way to support the values of inclusivity, diversity and participation that constitute community at the farm, and possibly others like it. This approach distinguishes it from other ludic designs such as the Indoor Weather Stations (Gaver et al. 2013) and the Energy Babble (Gaver et al. 2015), where the designs were completely new devices with which users will have had no experience, but echoes the move in reflective design “*away from designing new experiences to augmenting existing experiences in new ways*” (Sengers et al. 2005).

Design for the under-designed 1: other species

One of the problems of third-wave HCI is that we may be bringing unconscious workplace values of efficiency and problem solving into everyday life (Sengers et al. 2005; Gaver 2002). Within sustainable HCI it has been argued that, by focusing on individual behaviour change through increasing the efficiency of lifestyle practices, we are not taking a broad enough view of the complex issue of environmental concern (Dourish 2010; Brynjarsdóttir et al. 2012). Sengers et al. (2005) argue that we should be developing new methods to bring overlooked or marginal practices and experiences within HCI to the fore as a way to “*stimulate debate on the activities and values HCI practitioners can and should support*”.

By bringing hidden, overlooked and invisible parts of the farm into view, the Talking Plants and the Bug Hotel have provided opportunities to reflect on and change the limitations of design practice within sustainable HCI, and in this way help to answer **question 4**. These hidden, overlooked elements involve other species, and therefore the projects are examples of what DiSalvo and Lukens (2011) have termed *nonanthropocentric design*, or what Kobayashi (2014) has called *human–computer–biosphere interaction*. As DiSalvo and Lukens argue, by removing the human from the centre of design focus, nonanthropocentric perspectives can broaden the design space within HCI by providing

new opportunities for, and experiences of, design. Perhaps the most obvious and direct way it does so is through the generation of ideas: it enables a new exploration of the space of design possibilities that exists at the interface of environments, animals, and materials Thus, a nonanthropocentric perspective can generate concepts for design that may be overlooked or veiled in a typical human-centered approach. (DiSalvo & Lukens 2011)

How do we incorporate the non-human into design? How do we widen the design space of whom we care for, and what we are responsible for? The

Talking Plants project attempts to do this in a playful way by giving voice to plant species that otherwise do not have a voice, by attempting to create empathy for non-human actors. The Bug Hotel does it by making accessible the sound of the bees that are off limits to visitors, and by amplifying the sound of the bugs that cannot usually be heard. As the Talking Plants and the Bug Hotel have illustrated, considering other species in design forces us – both as designers and users – to rethink our place in the universe and “*to ask whether humans and nature can be integrated more effectively and mutually in a beneficial manner*” (Kobayashi 2014). It places us in a web of relations with other species, rather than at the top of a chain, where we can reflect on our interdependence with other species: without plants we have no food; without insects we have no plants.

I first of all reflect on how, as a researcher-designer, my thinking around what and whom I need to consider in the design process was challenged and how it evolved. In the case of the Bug Hotel, when I needed to re-secure a loose connection of the microphones inside the beehive I considered using hot glue. But when I heard that bees were sensitive to chemical and synthetic pollutants in the environment, I became concerned that the hot glue would have an adverse effect on the bees. I feared that they would choose to avoid that frame at best, or fall ill and die from the emissions at worst. In the end I found a creative solution by using melted natural beeswax as a glue to secure the wires. In the case of the Talking Plants, although I was aiming for a playful, interactive and engaging experience for humans, I was dealing with real live plants and had to consider what they needed to survive.

Other examples of how I was challenged to rethink who and what to take into account when designing for other species included the need to wait for a sunny day before inserting the microphone frame into the beehive, and discovering that Esther had removed the frame over the winter months because the colony was small and she decided that the colony would be too

cold with the extra frame inside. In other words, the health and well-being of the bees was given priority over my research needs.

This brought to the fore the limitations of my knowledge of working with other species, and Esther's role as the expert, which suggests that nonanthropocentric design has implications for community-based Participatory Design because it creates new roles and relationships and challenges the traditional idea of designer as expert (**questions 3 and 4**). A nonanthropocentric perspective foregrounds the recognition that other beings are not just material for the designer to use to their own ends, but, rather, autonomous agents with their own needs and desires that must be taken into account and not sacrificed to human needs and ends. In this way, it also highlights the question of who benefits from the design.

In addition to provoking reflection in myself as a researcher-designer, the Talking Plants and the Bug Hotel encouraged users to reflect on their taken-for-granted situation. Like other examples of nonanthropocentric ludic designs such as Dawn Chorus (Gaver 2002) and Cow-Cam.tv (Bissas & Agamanolis 2012), the Talking Plants and the Bug Hotel provoked a sense of empathy, identification, and greater connection with and appreciation of other living things. These projects asked users to reflect on the web of relations between humans and other species. For example, asking about people's concerns over the Bug Hotel at the consultation event elicited replies about interfering with the natural behaviour of insects: What if they eat each other? What if it attracts the wrong sort of bug? What if we disturb them by banging?

Ludic designs that involve other species, "*provoke us to reflect on these tradeoffs both in the particular and at the level of moral principles*" (Gaver et al. 2003). In the case of the Bug Hotel we have provided a home for them, but if we subsequently enjoy ourselves by listening to ourselves banging on the structure we may adversely affect them. In the case of the Talking Plants, if we neglect the plants, or indeed eat them, then we kill them. We have to make trade-offs between the needs of humans and the needs of other

species, which are sometimes in conflict. This is similar to the Dawn Chorus (ibid.), in which an artificially intelligent feeder teaches birds to sing new songs. *“This whimsical design may be appealing, but on reflection it raises disturbing issues about the ecological effects of interfering with birds’ natural behaviour”* (ibid.). Likewise, with the Bug Hotel, we are forced to consider our responsibilities and moral principles.

This points to a potential way forward for sustainable HCI, which has been criticised for being too accepting of the dominant assumptions and narratives that revolve around sustainable consumption. Drawing on discourses of deep ecology, DiSalvo and Lukens (2011) argue that, since anthropocentrism is often cited as a root cause of the ecological crisis we now find ourselves in,

a move toward more astute recognition of nonhumans and the interplay between humans and nonhumans would be, from that perspective, a move toward a more sustainable society and future. Shifting from a human-centered to a nonanthropocentric approach and granting legitimacy, if not equivalency, to plants, animals, and other biomass, would draw heightened attention to the need to understand and account for the systemic effects of design across species and throughout the environment.

Nonanthropocentric design does not mean doing away with the human; rather, it implies a *“radical pluralism”* (DiSalvo & Lukens 2011), in which humans and other species (and indeed other objects) are considered, in order to

better understand, describe, critique, or intervene in a given scenario In shifting away from a centring, and thus privileging, of human activities and desires, nonanthropocentric design broadens the conditions and issues of design and design research. At the very least it reveals new opportunities for and experiences of design, particularly in regard to designing new forms of engagement with and through technology.

By asking us to consider hidden overlooked species, nonanthropocentric design can help us view the community as the whole farm environment, an ecosystem, which also includes non-human members, and which requires mutual care (as described in Chapters 4 and 5), and can help strengthen a connection with nature.

Designing for other species poses significant challenges. For example, as DiSalvo (2011) points out, designing for other species poses the challenge of getting beyond benefit to humans. Should we evaluate nonanthropocentric design in terms of benefit to other species? Or is the design just a means to some human benefit? Does it encourage practices that ultimately benefit other species (for example, inspiring others to build more bug hotels as our Bug Hotel did, as described in Chapter 6) or provoke reflection on our interdependence with other species (for example, creating empathy with plants as described in Chapter 5)?

Design for the under-designed 2: other senses

The visual is privileged over the other senses in HCI, but the auditory is an important modality as it is a powerful and efficient communication channel and it can provoke emotional responses (Frauenberger et al. 2007). Findings from the Talking Plants and the Bug Hotel suggest that using sound in ludic encounters can contribute to reflective and inclusive engagement and therefore help broaden the design space of sustainable HCI. Therefore, another way to design for marginal experiences is to address under-designed-for senses, such as hearing.

Firstly, both research through design case studies found that sound contributed to an accessible, inclusive and intuitive engagement that encouraged conversations and did not compromise face-to-face interaction (**question 1**).

Secondly, by providing an effective way of making the hidden visible and giving life to the inaccessible elements of the farm, the sound elements of the

projects also provided for reflection, personal meaning-making, multiple interpretations and new perspectives on sustainability (**question 2**). It did this by making the familiar strange and the strange familiar (Gaver et al. 2004). For example, the familiar objects of the watering can and the plants are made strange through the sound of the plants talking through the watering can. Seeing everyday objects helps to break down the barriers of technology with which the community may be unfamiliar, while the unusual experience of encountering talking plants stimulated imaginative engagement and led to new insights. By amplifying the environment (Hallnäs & Redström 2001), sound kept people engaged with the Bug Hotel. For example, Esther spent many hours listening to the sounds from the beehive, from the very first time that we inserted the microphones. It kept drawing her back, until it became part of her work with the bees, as she would listen to the live sounds both before and after opening up the hive. It became a tool for her to monitor their state. I also found the sound of the beehive compelling, with its varying hums and buzzes: noises that I would never otherwise have access to. This was especially acute when it became apparent that I had recorded the bees two days before the entire colony died. As I listened again and again to the high-pitched, frantic hum of the beehive that seemed to indicate a desperate distress, I felt a sense of pain and despair, knowing that, in a matter of days, and without any other forewarning, disaster had struck. In this way, the sound helped create a greater sense of awareness of the other species. Coupled with the knowledge that the majority of our food crops depend on bees for pollination, and the worldwide crisis in colony collapse disorder, the sound helped manifest and concretise for me this crisis in a way that an abstract knowledge of the plight of the farm's and other colonies around the world could not. In this way, it contributed to a strong personal experience for me and helped me to consider the interrelation of humans with other typically overlooked species.

Researchers who wish to encourage reflective and accessible ludic encounters to open up new perspectives on sustainability should consider addressing underused senses such as the auditory.

Just do it

One of the main goals of Participatory Design is to share control with users in the design process (Vines et al. 2013; Robertson & Simonsen 2012).

Designers should strive for “*genuine participation*” in which marginalised groups and communities are involved in the decision-making processes that will affect them (Robertson & Simonsen 2012), and an approach is truly participatory only when the stakeholders are initiating and conducting the project, “*thereby becoming the audience for and the owners of the result*” (Akama & Ivanka 2010).

However, my experiences of conducting this research concur with the literature that finds that participation at all stages of the research is not always practical when working with communities that have unstructured work schedules and where there are significant challenges to finding reliable participants who are able to commit to more involved participation (Redhead & Brereton 2010; DiSalvo et al. 2012). Furthermore, the traditional methods within Participatory Design of involving people in decision-making processes, such as workshops, may be culturally inappropriate for some communities (Brereton et al. 2014).

Rather than aiming for a genuine participation in which members of the community initiate the project and are involved at all stages, my experiences of conducting this PhD research have taught me that sometimes it may be preferable for designers to initiate and build something with limited involvement from the community. The reason is that, while the community may have limited buy-in, the process and the designed outcomes may help to build relationships, stimulate creative ideas and lead on to greater collaborations.

In Chapter 5 I reflected on the limited participation of the Talking Plants project. The community did not initiate it or conduct it, and, while they were the audience of the final outcome, they were not the owners. There was limited stakeholder buy-in as indicated by a lack of staff interacting with it at the public demonstrations. Another example is the beehive microphone described in Chapter 6. Although I didn't have a clear idea of why I was doing it, or where it would lead, and it hadn't come directly from the community, it tapped into the existing values and interests of Esther, and therefore helped develop an excitement and exploration of technical possibilities that ultimately led on to the Bug Hotel.

However, a benefit of the ongoing involvement with the farm was the building and presentation of interactive devices. This allowed a deeper and more collaborative Participatory Design process to develop. It exposed the farm to my way of working, allowing members of the community to envisage new technical possibilities (e.g., listening stations). And it allowed for relationships between myself and the community to grow and strengthen. In this way it opened up new spaces and relationships for future work. It also helped to support the values of the community through engaging and enjoyable events (see more about designing inclusive events below).

Similarly, in conducting the consultation, Esther and I were seeking participation from the wider farm community. And yet, here, too, we held on to control, focusing the meeting on usage rather than aspects of the design. Esther remembered how we struggled with this tension between seeking participation and maintaining control:

How much do we allow ourselves to make the decisions and go with it. And I think that was quite a good balance actually of gauging people's interest and input but then also being quite free to go with it.

In the end, Esther thought that we reached a good balance.

Having the balance between consulting and decided no, it's OK to go with our thing, I think the consultation helped. Through it I discovered that people were interested in it as a project and liked it. So that was reassuring. But also it helped to come to that decision of, yeah, this is OK to go ahead and just make decisions and do it.

These examples help answer research **questions 3 and 4**, and speak to the relatively new field of community-based Participatory Design by describing the benefits of building a project that has been initiated and driven by the interests and experiences of the designer with limited involvement from the community – namely, that it can provide fruitful entry points to greater participatory work within the practical challenges of community-based organisations with irregular schedules and a volunteer-based task force; help to develop collaborative relationships in the longer term; expose the community to the designer's way of working; open up the community to new technical possibilities they had not considered before; and lead on to appropriation by the community of existing designs.

Similar suggestions have been made by Redhead and Brereton (2010), who explore an alternative to the more traditional Participatory Design approach of developing and refining prototypes in workshops before deploying to the field, by deploying an exploratory prototype in a public place within the community, and then refining it based on observations and feedback by users. This allowed the design to evolve without community members being required to commit to more formal workshops. Doing the work in this way contributes to the understanding of community-based Participatory Design as an evolving, growing methodology that emphasises relationships and processes.

Competing desires

While the Participatory Design literature often presents the designer as a facilitator who allows people to express their creativity at different levels (Sanders & Stappers 2008), or as someone whose role is to mentor or

demonstrate as to what is possible with new technology toolkits (Rogers & Marsden 2013), it is important not to mask the “*agency, expertise and agendas of the researchers or designers*” (Vines et al. 2013).

In reflecting on the case studies of the Talking Plants and the Bug Hotel, it was clear to me that my own agency, expertise and agendas were key to configuring the participation. I did not agree to just any of the valuable ideas that were raised in the participatory process, even though I was committed to the participatory goals of sharing control. In Chapters 5 and 6 I highlight the ways in which I negotiated this tension between the need to relinquish control in the service of greater participation and the desire to maintain control in the service of my own personal desires, interests and skills.

For example, staff approached me with ideas for technical projects they had that we could develop together: Esther wanted to make an interactive educational display that would incorporate recorded chicken sounds; Richard wanted to make a listening station in the Spiralfields Garden. Although I was happy that they had approached me, and I saw this as a sign of the success of my methodology of working and of building relationships, I was not overly excited by the ideas for these projects. Similarly, Esther wanted us to include pre-recorded songs and nursery rhymes inside the Bug Hotel, but in the end I decided against this as I thought it would compromise the slower and more reflective aspects of the project.

The risk of the designer not owning their own desires and skills is that participation is valued and seen as an end in itself, with all participatory research judged equally valid and successful. As Spinuzzi (2005) says, in Participatory Design “*the proof is in the pudding*”, implying that there can be no bad, unsuccessful or boring examples of Participatory Design because they are all equally committed to constructive social change. Drawing on participatory arts practice, Bishop (2012) talks about this lack of critical reflection when she argues that

All [works of participatory art] are perceived as equally important artistic gestures of resistance: there can be no failed, unsuccessful, unresolved, or boring works of participatory art, because all are equally essential to the task of repairing the social bond.

While I agree that this is a valuable aim, and a shift in the right direction away from technological systems, designed by “experts” in labs, that do not improve the lives of users, I also recognise a tension here. I believe that designers are, and should be, more than just facilitators, mentors or demonstrators. As Vines et al. (2013) write,

While control is certainly shared, it must not be forgotten that the researcher is as crucial an agent in the participatory process as any other participant. We have suggested that while there is a humanistic and democratic impulse within participatory research, we must be aware of the fundamental agency of the researchers and designers in configuring the process of participation and its outcomes.

I agree with this, and furthermore would argue that designers – whilst still maintaining a commitment to improving the lives of users and involving them in the design process – should own their own desires, skills and interests, and acknowledge the ways in which these contribute towards and shape the research, and make it richer. This resonates with Bishop’s arguments on the best kinds of participatory art:

Instead of obeying a super-egoic injunction to make ameliorative art, the most striking, moving and memorable forms of participation are produced when artists act upon a gnawing social curiosity without the incapacitating restrictions of guilt. (Bishop 2012)

When designers’ desires are in conflict with those of the community, and there are tensions between wanting to maintain control or cede it in the service of greater participation, I suggest that designers look for where their own desires dovetail or complement those of the community with which they are working

(questions 3 and 4). For example, when I presented the idea of putting microphones into the beehive, Esther said that it “*kind of chimed with me So yeah, I remember getting quite excited about that idea*” and we went ahead and did it. Likewise, when Esther approached me with the idea for the Bug Hotel, I was immediately excited and worked to make the idea a reality.

The idea of designer who brings their own skills, experiences and interest to the table is also in keeping with the ontological and epistemological assumptions of research that aims for dialogical encounters (Wright & McCarthy 2010). Dialogical design questions the position of the researcher or designer as an objective observer who does not influence the subject they are observing. I highlight this issue so that researchers can make greater efforts to articulate the roles of all stakeholders in a participatory process, including those of the design team.

Reciprocity and culturally appropriate engagement

This research contributes to the relatively recent field of community-based Participatory Design by providing a detailed account of the ways in which I worked with a diverse, non-settled community over three years. This may help others who wish to work with similar kinds of communities into which it may be difficult to gain entry, and to find volunteers and participants who can commit to a series of workshops. I have described and reflected on the ways in which I have designed culturally appropriate activities for engagement and reciprocity (Brereton et al. 2014) that have helped build trust and mutually beneficially relationships **(questions 3 and 4)**.

Practical steps for designers wishing to engage non-settled diverse communities similar to Spitalfields City Farm include:

- Spend as much time as possible with the community by taking part in regular activities, and talking with people, communicating that you are looking for collaborative relationships. People will get to know you and your interests.

- The design of inclusive events (or augmenting existing events) is an effective way of allowing diverse members of the communities that we work with to participate in enjoyable activities and contribute to meaningful social encounters. They contribute to an active notion of community (Nancy 1991) as constituted through activity in shared time and place. For example, in Chapter 4 I described how the workshops helped contribute to a feeling of community. In Chapter 5 I described how the public demonstrations of the Talking Plants helped add value to the farm by enhancing existing public events and contributed to public engagement. In Chapter 6 I described how the Bug Hotel consultation allowed for diverse members of the community to learn about each other's activities and therefore help build community cohesion. These events help contribute to the community and make it stronger. They address the aspects of Participatory Design that value process as much as the designed outcome (Robertson & Simonsen 2012). Other benefits of designing inclusive events is that they allow for varied people to be involved and to have their voices heard through engagement with non-technical and often non-verbal means (Bannon & Ehn 2012), thereby contributing to the evolving relationships between designer and participant, and creating rich materials that can serve as inspiration for future designs.
- Eating food with the community taps into the values of urban agricultural communities such as Spitalfields City Farm and is therefore culturally appropriate. It helps develop relationships that are built on reciprocity (Brereton et al. 2014).
- Relying on email and phone communications is not recommended as many members of the community don't use these and it does not allow for serendipitous encounters.
- Fit things around the schedules of the community members. For example, do not schedule workshops at the same time as staff meetings (as I described having done in Chapter 4).

- It is necessary to be flexible and allow for the unexpected. For example, in Chapter 4 I described how I judged the situation on the ground and decided to make a fire instead of running a workshop. Such culturally appropriate activities build reciprocity through mutual trust, learning, engagement and benefit. Responding flexibly to the situation was a chance for me to build relationships in a relaxed situation compatible with the local sociocultural practices of the community.
- In all interactions with the community, present yourself as a resource to that community. This means explicitly taking a stance of being open to new ideas and collaborations.
- At the same time, when working with communities, designers should acknowledge the polyvocal nature of the context. Communities are not unified groups with a single identity. Projects may engage a number of different communities, each with their own conflicting needs. I believe that a concept of community formed by a shared activity in a particular time and place, as discussed in Chapter 2, will allow for the work to evolve and adapt and be inclusive, and therefore be more resilient. Within a community there may be conflicting needs between different groups, but also between the needs of the individual and the needs of the group. This suggests that designers should be sensitive to these tensions and not try to smooth them away.

Balancing ludic and community-based Participatory Design

The research through design case studies described in this thesis have highlighted the challenge of balancing a commitment to improving the lives of users when employing a community-based Participatory Design methodology, and the non-utilitarian, open and playful values of ludic design (**questions 1, 3 and 4**). Ultimately, I would argue, this tension is productive because it provides opportunities to address limitations of both ludic and community-based Participatory Design, helping to find the “*sweet spot*” between banality

and incomprehensibility (Gaver et al. 2013), and therefore has implications for both fields of research.

I began by reflecting on these tensions with the Talking Plants study. On the one hand, because I was committed to supporting the values, practices and needs of the farm arising out of the community-based Participatory Design methodology, discussions around, and evaluation of, the Talking Plants were framed in utilitarian terms as follows: encouraging and educating people to grow their own food; helping to identify plants; acting as verbal labels; reducing the amount of time staff had to spend answering questions; and increasing plant sales and thereby generating income. This utilitarian framing made sense to me as a way to compensate for the fact that the community had not invited me in nor initiated the research, and because I did not want to introduce an idea that would lack relevance or value to their work.

On the other hand, I did not want solely to impart information about food growing as in Lyle et al. (2013) and Norton et al. (2014), or contribute directly to sales or increasing productivity. By creating a ludic encounter with plants that talk to you in the first person via a watering can, I aimed for a pleasurable and fun experience that would open up new perspectives about our relationship with the environment and challenge dominant narratives of utility and productivity within sustainable HCI. It was for these reasons that I decided to have the plants talk in the first person and have their own personas. But they still needed to be informative.

Ultimately, I would argue that this tension is productive because it may help find the sweet spot between banality and incomprehensibility (Gaver et al. 2013). I believe that community-based Participatory Design can strengthen the ludic by grounding it in the values of the community, making it a bespoke solution rather than a generic one, helping to overcoming claims of obscurity and lack of relevance in their users' lives (Bødker 2006; Sengers et al. 2005; Bowers 2012), while a ludic focus can help Participatory Design get beyond

rational solutions, utilitarian logic, and the tendency to remain within what we know.

To illustrate this point I turn to reflections on the Bug Hotel. By privileging a reflective experience inspired by slow technology over a flashier and more entertaining and immediately appealing one, I expected listeners to ask themselves questions such as: What does it do? What can I hear? What does it mean if I can't hear anything? Are the bugs sleeping or have they all checked out? This is similar to the ChatterBox example of slow technology, which, compared to more immediately responsive interactive systems, is *"less impressive from a technological point of view, and many 'users' started out with the question 'So what?'. This is nevertheless a starting point for reflecting upon it: What does it do?"* (Hallnäs & Redström 2001). However, as Esther reported and my observations confirmed, the Bug Hotel was not working (for humans, at least – perhaps for the bugs it was working better as there was no one banging on it at this time). As Hallnäs and Redström (2001) point out, slow technology risks being perceived as *"some poorly designed and, as a result, useless tool"*. This echoes findings with the Indoor Weather Stations (Gaver et al. 2013): participants were still oriented to the devices' potential utility, but found the environmental narrative of the devices inadequate. *"Provocation requires a level of defamiliarization, but this fails if devices are either too familiar, or too alien"* (ibid.). Likewise, the Bug Hotel was too alien, too slow, and had overbalanced towards obscurity and incomprehensibility. It was only by taking on board the suggestions of the community to include pre-recorded sounds that the Bug Hotel righted itself and turned away from obscurity to become meaningful and enjoyable.

At the same time, if I had been solely committed to the community-based Participatory Design, without a ludic, non-utilitarian focus, I believe that it would have become banal. For example, Esther suggested we incorporate songs about insects, as well as music composed by a local music group, into the Bug Hotel playlist. However, I felt that including this music would detract

from the more reflective and slow aims of the Bug Hotel, and tip the scales towards banality.

To summarise: On the one hand, a community-based Participatory Design implies a responsibility and commitment towards supporting the real needs of the community, which results in a pull towards producing something measurably useful. But this risks falling into dominant narratives and unexamined assumptions about utility and efficiency. On the other hand, a ludic focus resists dominant narratives of utility and productivity, and aims for reflective and open-ended interpretations, which are much more difficult to measure. But, by privileging provocation without a commitment to improving the lives of users, ludic design risks being obscure and irrelevant to people's lives. Balancing the ludic and the commitments of community-based Participatory Design may help find a sweet spot between the banal and the incomprehensible.

Limitations of the research

Evaluation of the Talking Plants was limited to very short-term and immediate engagements with visitors to the farm at three public demonstrations. This is in contrast to other ludic designs, such as the Indoor Weather Stations (Gaver et al. 2013), which were left with users for a number of months. I also acknowledge that most of the data came from visitors to the farm, and not from staff and volunteers. Although key staff members helped in its development, they never experienced it first hand, and this raises significant questions about its use and meaning to the community. It would be valuable to find ways of evaluating the system with staff, volunteers and visitors over a longer period of time. This is something that I hope to pick up on in future work (see below).

While evaluation of the Bug Hotel was conducted in greater depth than the Talking Plants study, it was limited primarily to the experiences and reflections

of a single person. I acknowledge that I did not get a wide variety of interpretations of use, and that, furthermore, there may have been significant dissenting or sidelined opinions from the community that were not taken into account. Although there were many discussions with the farm community about how to best capture feedback about the Bug Hotel over the longer term, this was not possible within the time limits of this research and remains within the realm of future plans. In Chapter 6 I described how insect populations were beginning to colonise the Bug Hotel nearly two years after it was built. As with the Indoor Weather Stations, a longer time span of evaluation would no doubt reveal people's evolving interpretations as the Bug Hotel and its inhabitants change through the seasons and along with the slow pace of nature.

Concluding remarks

Most often, design is understood as disconnected from the politics of consumption (Dourish 2010). But design is informed by the cultural narratives we tell ourselves – of natural resources being unlimited, of technological progress, of the separation of technology from politics, of the unstoppable nature of free market capitalism, and of the incompatibility of agriculture and urban space. The current global economic and environmental crises demand a change in these cultural narratives (Brynjarsdóttir et al. 2012; DiSalvo et al. 2009).

By engaging with urban agricultural communities, designers have a chance to learn from, and help increase participation in, collective food-growing activities, thereby moving beyond the model of designing for individual consumers. Focusing on these sites highlights the ways in which we can begin to shift the conceptualisation of sustainability within HCI from a discourse of sustainable consumption towards a collective, participatory and holistic understanding that takes into account the social, economic and

environmental aspects of sustainability within contemporary urban life. It allows us to expand the design space towards seeing the environmental crisis as a communal problem that requires communal action, where individuals can work collectively to ameliorate the destructive impact of our current practices on the environment (Boucher et al. 2012).

Designing ludic encounters through community-based Participatory Design provides a way to make these communities more resilient, through playful interactions and creative endeavours that support the work that they do (DiSalvo et al. 2012). It highlights an intentionality about kinds of political commitments to raising awareness of, or attempting to tackle issues of, environmental concern. At the same time, it means that designers have methodological commitments to conducting the research in ways that are sensitive and inclusive to the specific local contexts in which they are working, and the particular practices of those contexts. Incorporating a ludic aim highlights a perspective that aims to open up new spaces for reflection and play, which go beyond a focus on utilitarian solutions. I have given evidence that such an approach is useful in the area of food systems. Whether this is useful in other areas is left open to other researchers.

By working in this way with such communities we can observe changes in cultural narratives in action. I recognise that the farm and other farming communities are not separate from the capitalist system within which they function, and therefore they still participate in it. But because of their values, the way they are run, and the activities they offer to all, which help strengthen the links between collective action, participation and citizenship, they present a site where such shifts can begin to occur. It is our job as designers in sustainable HCI to support and strengthen these shifts.

Future work

Many of the findings, strategies and challenges arising from this research lay the groundwork for further research to be taken up at postdoctoral level as I begin working on the EPSRC-funded Connected Seeds and Sensors project. Funded through the Research in the Wild–Internet of Things funding stream, the project partners with Spitalfields City Farm to investigate the ways in which the Internet of Things can support more sustainable food production and consumption in the city. A community-based Participatory Design methodology will be used to co-create, conduct and evaluate the research with the farm. We will use connected sensors and tracking technologies to support the telling of stories of seeds and plants, as well as the people who grew them. Through the development of a smart seed bank we will interrogate how the combination of smart sensors, data collection and participatory co-design can help raise awareness, empower communities and increase participation in sustainable urban food practices. Although we have not specified a ludic component, by focusing on the stories of seeds, plants and the people who grew them we will examine ways to expand sustainable HCI beyond its traditional discourses around efficiency and utility. In addition, through workshops, celebratory seed swap days, the production of an exhibition, a toolkit and a documentary film the project will draw on the cultural production and creative endeavours of community-based Participatory Design. The project will continue to apply and extend the insights gained through this PhD research and disseminate the findings to academic and non-academic audiences. Most excitingly, it will offer me an opportunity to continue to extend and build on the collaborative relationships with the farm community that I have been developing since 2010. I look forward to this new stage of collaboration with key people from this PhD research who are on the partner's steering committee, including Mhairi, Esther, Mandy, Olivia, Lutfun and Richard.

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