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Introduction

We live in the Age of Information. Key words and phrases are among the important tools we use to navigate the sea of research and data that surrounds us and alternately carries us forward or threatens to swamp us in a deluge of miscellaneous opinions and incoherent sets of facts. For this special issue of the journal devoted to Participatory Design, the list of appropriate key words and phrases includes: co-design, collaboration, mutual learning, situated design, opportunity-based change and infrastructuring design. The list neatly suggests the nature of Participatory Design as a form of design practice embedded in specific contexts and working with particular constituencies to envision viable and desirable alternatives to the status quo. What no list of words and phrases can do, no matter how evocative or novel, however, is to facilitate a better understanding and a nuanced appreciation of strengths and weaknesses of different design concepts and strategies. The editors of Design*Issues* believe in the value of collecting the experiences and commentary of designers and design researchers who actively engage in developing new forms of design efforts like Participatory Design.

A special issue such as this brings before readers provocative ideas grounded in rigorous research, links research to practice (and vice versa), and calls to our attention best practices. Reading and reflecting upon the insights and discoveries of scholars and practitioners like those assembled for this issue by Toni Roberstson and Jesper Simonsen provide the kind of foundation at which keywords can only hint. In their introduction, they describe the origins of these articles and provide a broad overview of the themes and organization of this special issue. They introduce the concept of Participatory Design as "the direct involvement of people in the co-design of tools, products, environments, businesses, and social institutions to ensure these work in ways that are more responsive to human needs." They alert the reader both to the relationship with, and more significantly, the important distinctions between Participatory Design and other forms of design practice such as user-centered design and the design of Information Technologies.

We live in an age characterized by pressing economic, environmental and social problems, and at the same time, an age marked by great possibilities. Informed by the practices and the

values of Participatory Design designers can fulfill a crucial and exciting role in collecting the experience, harnessing the wisdom and envisioning the hopes and dreams of communities everywhere. What more noble form of professional service could we imagine for designers?

Bruce Brown
Richard Buchanan
Dennis Doordan
Victor Margolin

Challenges and Opportunities in Contemporary Participatory Design

Toni Robertson, Jesper Simonsen

At the core of Participatory Design is the direct involvement of people in the co-design of tools, products, environments, businesses, and social institutions. In particular, Participatory Design has developed a diverse collection of principles and practices to encourage and support this direct involvement. Many of the design tools and techniques generated to further this process have become standard practice for the design and development of information and communications technologies and increasingly other kinds of products and services. These design tools and techniques include various kinds of design workshops in which participants collaboratively envision future practices and products; scenarios, personas and related tools that enable people to represent their own activities to others (rather than having others do this for them); various forms of mock-ups, prototypes and enactment of current and future activities used to coordinate the design process; and iterative prototyping so that participants can interrogate developing designs and ground their design conversations in the desired outcomes of the design process and the context in which these will be used.[1] Participatory Design has also pioneered and developed some of the basic research questions, methods, and agendas that have recently been taken up by design research in more traditional design environments (e.g., innovation through participation).[2]

Increasingly, participatory designers have sought to develop processes to enable active stakeholder participation in the design of the tools, environments, businesses, and social institutions in which these information and communication technologies are embedded. These widened contexts have been reflected in the themes of recent Participatory Design conferences and in the substantive focus of the research presented in them.

Participatory Design: A Brief Overview

The beginnings of contemporary Participatory Design lie primarily in the restless and exhilarating days of the various social, political and civil rights movements the 1960s and 1970s. People in many western societies demanded an increased say in the decisions that affected many different aspects of their lives. Some designers and design researchers participated very directly in these activities and

1 Jesper Simonsen and Toni Robertson, eds., *Routledge International Handbook of Participatory Design* (London: Routledge, 2012).

2 Jesper Simonsen et al., eds., *Design Research: Synergies from Interdisciplinary Perspectives* (London: Routledge, 2010).

some also responded by investigating how they might relate to their own practices. Community arts projects were common; architects and planners got involved in the participatory planning of community housing; and a major conference sponsored by the Design Research Society and held in Manchester took *Design Participation* as its theme.[3]

At this time too, and by no means unrelated, what we now call the Participatory Design of information technology was pioneered in Europe and especially in Scandinavia as part of what later became known as the workplace democracy movement. Writing of this early work, Morten Kyng observed that "As part of the transformation of the workplace, working conditions for many end users have changed dramatically, and not always for the better."[4] Participatory Design researchers and Scandinavian trade unions initiated a range of collective activities to question existing approaches to the computerization of the workplace, to create visions of different kinds of future workplaces and practices and to design the new computer based systems that would shape them. The active involvement of those who would use these new technologies was central to and defining of these activities. The aims were to support users and enable them to use and enhance their skills while avoiding any unnecessary or negative constraints or automation of their work tasks. New ways of designing were needed that relied on new forms of cooperation between end users and professional system developers. This essential, emancipatory commitment, the motivation behind it, and the context from which it emerged have driven the development of Participatory Design ever since.

The international Participatory Design research community gathers at the biennial Participatory Design Conferences (PDCs). This conference series started as a dialogue about user involvement in IT systems development between Scandinavian scholars and promoters, on the one hand, and Europeans and Americans interested in how the Scandinavian experience might be adopted and expanded on the other. The first PDC was held in Seattle in 1990, and the conferences have been held every other year since.[5] They continue to provide an important venue for international discussion of the collaborative, social, ethical, and political dimensions of design. Today, Participatory Design is a well-established area of research and an important practice across many design disciplines.

These days, user participation within information and communication technology design is widely accepted and practiced through the use of iterative design techniques such as mock-ups and prototyping. User participation is central to the development of understandings and practices that are defining current trends in, for example, design thinking and user-driven innovation. But the meaning of participation does not reduce to 'involvement,' and Participatory Design is not the same as 'user-centered design;' though

3 Nigel Cross, *Design Participation* (London: Academy Editions, 1972).

4 Morten Kyng, "Designing for a Dollar a Day," in CSCW '88, *Proceedings of the Conference on Computer-Supported Cooperative Work* (New York: ACM Press, 1988), 178-88.

5 All Participatory Design Conference proceedings from 1990 are available from http://pdcproceedings.org (1990-2002 as free downloads and from 2004 via the ACM Digital Library).

the two can have much in common and some design tools and techniques are used in both. While many areas of design now pay at least lip service to people's participation, the question of how participation is being negotiated and defined (and by whom) is fundamental to distinguishing Participatory Design from the more common user-centered approaches. Participatory Design projects are always driven by ongoing and systematic reflection on how to involve users as full partners in design and how this involvement can unfold throughout the design process. The basic motivation remains democratic and emancipatory: Active participation needs to define Participatory Design because if we are to design the futures we wish to live, then those whose futures are affected must actively participate in the design process. This is the reason why Participatory Design continues to develop processes, tools, and methods that can enable active and engaged participation in design activities, wherever and whenever they occur.

"Participation" in Participatory Design means to investigate, reflect upon, understand, establish, develop, and support mutual learning processes as they unfold between participants in collective "reflection-in-action" during the design process. Designers strive to learn about the practices and contexts of those who will use their designs, while end-users and other participants in the process strive to learn about possible technological options. Mutual learning throughout the process provides all participants with increased knowledge and understandings: Potential users about what is being designed; designers about people and their practices; and all participants about the design process, its outcomes and how both can influence the ways we live and the choices we can make.

Participatory Design has been defined by a strong commitment to understanding practice, guided by the recognition that designing the technologies people use in their everyday activities shapes, in crucial ways, how those activities might be done. Understandings of practice, gained through various forms of ethnographic inquiry, are exploited as alternatives to the formal diagrams and heavily abstracted work flow processes that define traditional approaches to technology design. Practice plays a central epistemological role in Participatory Design that complements its rejection of technology-driven formalisms and rationalist models of both work and design, along with their focus on individual work tasks. The focus on practice recognizes the role of everyday practical action in shaping the worlds in which we live. Most importantly, practice is understood as a social activity; it is the community that defines a given domain of work and what it means to accomplish it successfully.[6]

One of the greatest challenges in Participatory Design projects is to ensure that they continue long enough through the development and implementation of new products and situations to

6 Lucy Suchman and Randall Trigg, "Understanding Practice: Video as a Medium for Reflection and Design," in *Design At Work: Cooperative Design of Computer Systems*, Joan Greenbaum and Morten Kyng eds. (Chichester, UK: Lawrence Erlbaum Associates, 1991).

fully explore the mutual learning and to both reflect on and otherwise evaluate the process and its outcomes. This has become more difficult to manage with the increasing availability of off-the-shelf products and the rise of domestic, mobile, and embedded technologies. Systems and applications are rarely developed from scratch. It is more usual for generic components to be purchased and then configured within specific settings. Participatory designers have needed to develop new design processes, tools and techniques to enable mutual learning, design reflection and evaluation in projects where individual components are configured into useful devices and services.[7]

Practices change over time, often in response to opportunities provided by new technologies and to developing protocols about their use. How particular technologies are used and the roles they play are shaped by the situations in which they are embedded. Many of those involved in Participatory Design recognize that design is completed in use. During the 1990s, this recognition resulted in a marked interest in the tailor-ability of systems, so that users could adapt them to suit their needs after implementation.[8]

As a result, Participatory Design research and practice includes studies of actual technology use and ongoing reconfigurations of particular settings and practices. The ongoing design iterations so central to Participatory Design practice can include evaluations of implemented technologies after they have been used for a period of time and can also be included as part of ongoing commercial projects.[9] Exploring practices that involve the use of actual technologies offers Participatory Design practitioners valuable opportunities to understand the fundamental ways in which these, too, rely on the material and social circumstances at hand.[10]

Those working in Participatory Design know that involving the people, who understand the practices and environments where new products and services will be used, as active participants in the design project means that the process and its outcome are more likely to be accepted and sustained. After all, these people know most about what the new designs need to do, and will be the key actors in implementing change and making the new practice work. We have also learned over the years that in the design of complex products, the success of the outcome is fundamentally linked to the different voices able to contribute to its design. When different voices are heard, understood and heeded in a design process, the results are more likely to be flexible and robust in use, accessible to more people, more easily appropriated into changing situations, and more adaptable to these situations over time.

An ethical stand underlies Participatory Design in that it recognizes the accountability of design to the worlds it creates and the lives of those who inhabit them.[11] Working in genuine partnership with those who will use the technologies we build is our way

7 Ellen Balka et al., "Reconfiguring Critical Computing in an Era of Configurability," in *Proceedings of the Fourth Decennial Conference on Critical Computing* (New York: ACM Press, 2005), 79-88.

8 Randall Trigg and Susanne Bødker, "From Implementation to Design: Tailoring and the Emergence of Systemisation in CSCW". In *CSCW ' 94, Proceedings of the Conference on Computer-Supported Cooperative Work* (New York: ACM Press, 1994), 45-54; Toni Robertson "Shoppers and Tailors: Participative Practices in Small Australian Design Companies," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 7, 2-3 (1998): 205-21.

9 Monika Büscher et al., "Ways of Grounding Imagination," in *Proceedings of the 8th Participatory Design Conference: Artful Integration: Interweaving Media, Materials and Practices* Volume 1 (New York: ACM, 2004) 192-203; Thomas Riisgaard Hansen et al., "Moving Out of the Laboratory: Deploying Pervasive Technologies in a Hospital," *IEEE Pervasive Computing* 5, no. 3 (2006): 24-31; Morten Hertzum and Jesper Simonsen, "Effects-Driven IT Development: A Strategy for Sustained Participatory Design and Implementation," in *Proceedings of the 11th Biennial Conference on Participatory Design: Participation – the Challenge* (New York: ACM Press, 2010): 61-70.

10 Lucy Suchman, *Plans and Situated Actions: The Problem of Human-Machine Communication* (Cambridge: Cambridge University Press, 1987).

11 Toni Robertson and Ina Wagner, "Ethics: Engagement, Representation, and Politics-in-Action," in Jesper Simonsen and Toni Robertson, eds., *Handbook of Participatory Design*, 2012.

of taking a stand on who we can be as designers and design researchers. Our ongoing challenges are to create the situations in which these partnerships can flourish and to develop the design processes, tools, and methods needed to enable full and active participation in the full range of design activities.

This Volume

This special issue, *Challenges and Opportunities in Contemporary Participatory Design*, presents insights from the past two PDCs. Eight papers were selected for their exploration of a wide range of current challenges and directions in the field, and these have been reworked, rewritten, and edited for the broader audience of *Design Issues*.

The theme for the tenth conference, PDC 2008, was *Experiences and Challenges*. The theme was chosen to honor two decades of biennial conferences. Contributors were asked to reflect on past experiences and review the important lessons we have learned so as to ready ourselves for the new challenges of the future. Five papers from this conference were chosen as a basis for this Special Issue. Together, they explore important trends, phenomena, developments, and views on both participation and design, which in so many different ways challenge our traditions, our experiences, and the current "wisdom" in the field.

After marking the tenth conference with this important reflection on the past in light of current issues and challenges, the eleventh conference, PDC 2010, was explicitly a forward-looking conference. Held in Sydney—for the first time outside the northern hemisphere—the conference theme, "*Participation:: the challenge*," was chosen to encourage an exploration of what participation can and needs to mean in current and future design contexts and to broaden participation in the conferences to include people from other design domains, as well as from industry (particularly small design companies) and academia. Three papers from this conference have been developed for this Special Issue.

Three of the articles in this special issue take up a call from Dan Shapiro to find ways of bringing Participatory Design into large development projects.[12] Johannessen and Ellingsen argue that iterative and agile Participatory Design methods can be applied to large-scale systems development, but this application implies that complex organizational issues are also addressed as part of the Participatory Design process. Their article is grounded in a health-related project, as is that of Simonsen and Hertzum, which reports and reflects on the extraordinarily thorough "wizard-of-oz" prototyping of a new electronic patient record system. Simonsen and Hertzum argue for the extension of well-known iterative approaches in Participatory Design to include the implementation of mature prototypes that can be evaluated during real work over

12 Dan Shapiro, "Participatory Design: The Will to Succeed," in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility*, (New York: ACM, 2005) 29-38.

an appropriate amount of time. Such long-term evaluation can follow anticipated changes to practice while emergent and opportunity-based changes are also able to contribute to ongoing design. These are the changes that can genuinely improve the quality and acceptance of future systems and that drive the design of better workplaces and health systems in the future. Dalsgaard's paper moves away from information and communication technology development to examine the extension of Participatory Design methods and techniques into urban planning. His paper reports on a large-scale public project in which participatory approaches were used to bring new ideas from the local community into the design and building of a new municipal library and the services it could offer.

Four of the articles in this volume reflect the widening focus of Participatory Design to include a variety of community settings. DiSalvo, Louw, Holstius, Nourbakhsh, and Akin contribute a thoughtful account of engaging ordinary people in creative design and, through this engagement, their participation in the design of their local communities. Their particular focus used technology for environmental sensing, which then enabled the local community to organize actions around the results. Hess and Pipek provide a critical investigation of the extent to which online communities can form a basis for the Participatory Design of a commercial product, accounting how a software company invited members of its existing online user community to participate in the further development of the product they already use. A study of the design and use of social technologies in community settings grounds Hagen and Robertson's paper. They examine how social technologies are characterized by being designed through use—leading, in turn, to new forms of participation. Social technologies are widely used in self-reporting during design projects, but when they are used in the design of social technologies themselves, they offer many opportunities for seeding content and encouraging participation by the community for whom the technologies are being developed.

Participatory Design projects in developing countries have been part of the field for more than 20 years. The account by Winschiers-Theophilus, Bidwell, and Blake of African philosophy in sub-Saharan Africa reminds us of the need to understand and comply with different cultural traditions in particular cultures and local environments—particularly in terms of how participation is understood and practiced. We cannot assume that all our participants live and act within liberal democracies.

Finally, the strong relations between Participatory Design and the recent attention to design thinking are drawn out by Björgvinsson, Ehn, and Hillgren. They suggest that some of the practical, political, and theoretical challenges of Participatory Design might be relevant to contemporary design thinking. In

particular, they argue for a move beyond designing objects and specific design projects to "infrastructuring" design so that conditions are established for continuing participation in the design of solutions for complex issues and for envisioning positive and sustainable futures.

We hope that readers of *Design Issues* enjoy this volume with its presentation of some of the challenges and opportunities in contemporary Participatory Design.

Sustained Participatory Design: Extending the Iterative Approach

Jesper Simonsen, Morten Hertzum

Introduction

In 2005, Shapiro described how many large-scale systems development projects are highly troubled.[1] Attempts to introduce ambitious information systems in the public sector have been especially notorious for being late, over budget, or functionally inadequate; in addition, "the situation in the private industry may be no better, but commercial confidentiality and the lack of public accountability may make it less visible."[2] For Participatory Design approaches to lead to the best and most effective systems that support the work they are used for, "Participatory Design as a community of practitioners should seriously consider claiming an engagement in the development of large-scale systems."[3]

Participatory Design undoubtedly has a lot to offer. Benefits can accrue in terms of clarifying goals and needs, designing coherent visions for change, combining business-oriented and socially sensitive perspectives, initiating participation and partnerships with different stakeholders, using ethnographic analyses in the design process, establishing mutual learning processes with users from the work domains in question, conducting iterative experiments aimed at organizational change, managing stepwise implementation based on comprehensive evaluations, and providing a large toolbox of different practical techniques.

Participatory Design is characterized by the intention of establishing mutual learning situations between users and designers.[4] A sustained Participatory Design approach allows an organization to experiment and learn—not only as part of the initial design, but also as part of the organizational implementation and use of a technology. The overall design process that includes, and transcends, the technical development of a technology has been identified by Markus as "technochange" management and, in particular, as a technochange prototyping approach.[5] Technochange combines large information technology (IT) projects with organizational change programs to produce technology-driven organizational change: "Here, what is to be prototyped is not just a technical solution or just an organizational change, but both together."[6] The technochange prototyping approach uses the traditional iterative prototyping approach as an overall model for organizational change.

1 Dan Shapiro, "Participatory Design: The Will to Succeed," in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility* (New York: ACM Press, 2005), 29-38.

2 Ibid., 30.

3 Ibid., 32.

4 Keld Bødker et al., *Participatory IT Design. Designing for Business and Workplace Realities* (Cambridge, MA: MIT Press, 2004).

5 Lynne Markus, "Technochange Management: Using IT to Drive Organizational Change," *Journal of Information Technology* 19, no. 1 (2004): 4-20.

6 Ibid., 17.

Iterative Participatory Design experiments using various sorts of mock-ups and prototypes have been conducted for decades.[7] However, most experiments have been restricted either to small-scale systems (often driven by researchers), or to the initial stages of larger scale information systems development, followed by a conventional contractual bid.[8] Recently, however, a growing number of Participatory Design experiments includes both initial design and real-use evaluation.[9]

Active engagement in—and documentation of results with—large-scale information systems represents a major goal for Participatory Design. In this article, we pursue Shapiro's call for a collective approach by extending the iterative prototyping approach into a sustained Participatory Design approach, including large-scale Participatory Design experiments. We do this by means of an exemplary reflection: *What are the challenges that Participatory Design must face when engaging in design and implementation of large-scale information systems?* We describe and reflect on a Danish Participatory Design initiative in the healthcare sector involving a Participatory Design experiment with an Electronic Patient Record (EPR) system. The experiment was conducted by the authors in close collaboration with the vendor, CSC Scandihealth (CSC), and the customer, the region of Zealand, one of Denmark's five healthcare regions—and in particular, the region's EPR unit and the neurological stroke unit at Roskilde Hospital. We describe the experiment and our experiences and present the challenges that the Participatory Design paradigm must address to succeed in filling a greater role in large-scale information-systems projects.

A Sustained Participatory Design Approach

Our sustained Participatory Design approach introduces iterations of design and implementation and emphasizes improvisation, experimentation, and learning. This approach challenges conventional plan-driven approaches that maintain a clear distinction between design and organizational implementation.[10] Orlikowski and Hofman suggest that, as an alternative model for managing technological change, improvisational change management be defined as "a way of thinking about change that reflects the unprecedented, uncertain, open-ended, complex, and flexible nature of the technologies and organizational initiatives… [where] managing change would accommodate—indeed, encourage—ongoing and iterative experimentation, use, and learning."[11]

Orlikowski and Hofman characterize improvisational change management by distinguishing between three kinds of organizational change: anticipated, emergent, and opportunity-based.[12] *Anticipated change* is planned ahead and occurs as intended by the originators of the change. *Emergent change* is defined as local and spontaneous changes, neither originally anticipated nor intended. Such change does not involve deliberate actions but

7 For a more elaborated review of related literature, see Jesper Simonsen and Morten Hertzum, "Participatory Design and the Challenges of Large-Scale Systems: Extending the Iterative PD Approach," in *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008* (New York: ACM Press, 2008), 1-10.

8 For the former, see Andrew Clement and Peter van den Besselaar, "A Retrospective Look at PD Projects," *Communications of the ACM* 36, no. 6 (1993): 29-37; Anne-Marie Oostveen and Peter van den Besselaar, "From Small Scale to Large Scale User Participation: A Case Study of Participatory Design in E-Government Systems," in *PDC 04: Proceedings of the Eighth Conference on Participatory Design: Artful Integration: Interweaving Media, Materials, and Practices* 1 (New York: ACM Press, 2004), 173-82. For the latter, see Keld Bødker et al., *Participatory IT Design.*

9 See, e.g., Monika Büscher et al., "Ways of Grounding Imagination" in *PDC 04: Proceedings of the Eighth Conference on Participatory Design*, 193-203; Thomas Riisgaard Hansen et al., "Moving Out of the Laboratory: Deploying Pervasive Technologies in a Hospital," *IEEE Pervasive Computing* 5, no. 3 (2006): 24-31.

10 Barry Boehm and Richard Turner, *Balancing Agility and Discipline: A Guide for the Perplexed* (Boston: Addison-Wesley, 2004).

11 Wanda Orlikowski and Debra Hofman, "An Improvisational Model for Change Management: The Case of Groupware Technologies," *Sloan Management Review* 38, no. 2 (1997): 12.

12 Ibid.

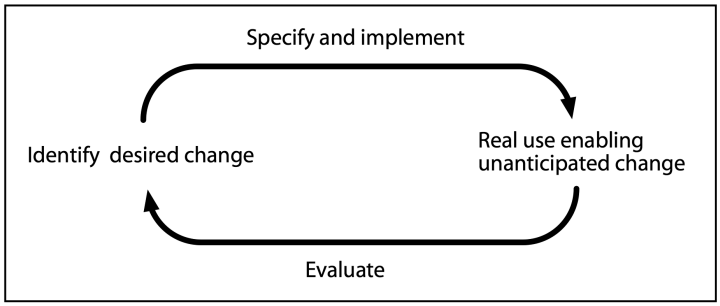


Figure 1
Outline of our sustained Participatory Design approach.

grows out of practice. *Opportunity-based changes* are purposefully introduced changes resulting from unexpected opportunities, events, or breakdowns that have occurred after the introduction of a new information system.

Emergent and opportunity-based changes are widely noted in Participatory Design projects,[13] but there has been surprisingly little focus on managing and learning from such changes over longer periods of time. A sustained Participatory Design approach in large-scale information-systems projects entails the integration of design and development with organizational implementation. This integration is necessary to obtain data and experiences from real use during design and development and thereby to move iteratively through the three change perspectives: (1) evaluate progress on planned changes, (2) become aware of emergent changes, and (3) turn selected emergent changes into opportunity-based changes. Charting progress on planned changes is a means to ensure that system possibilities get integrated into actual work practices, while turning emergent changes into opportunity-based changes is a means to ensure that work practices are changed in relevant ways.

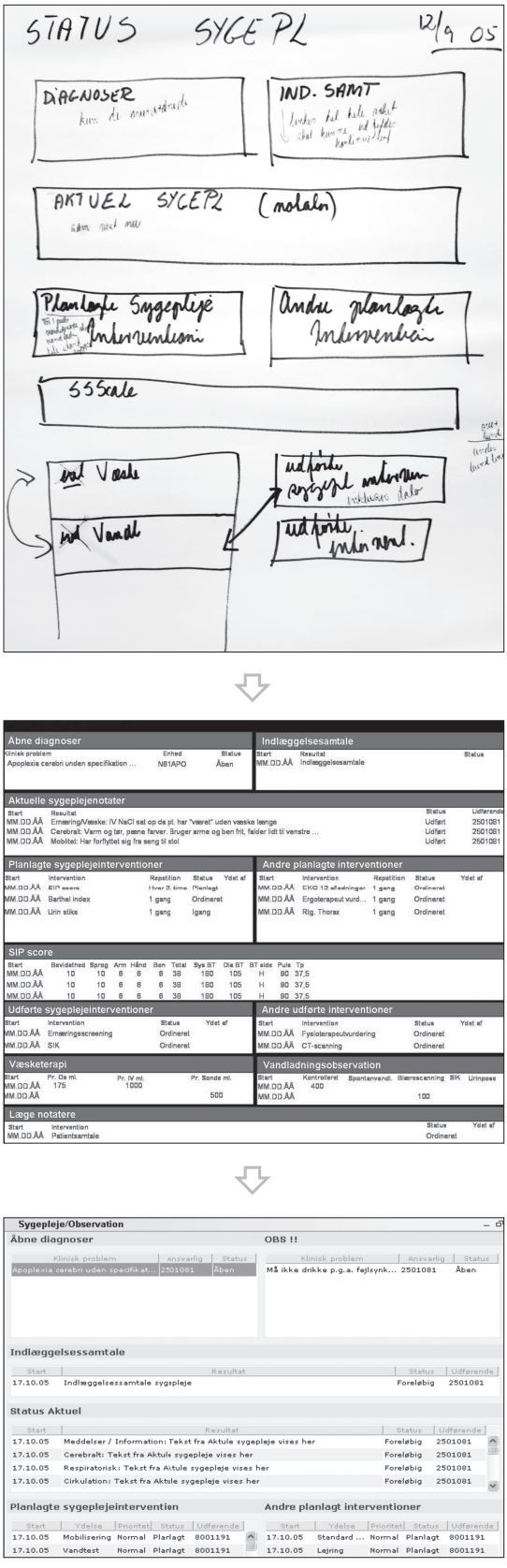
Our sustained Participatory Design approach—outlined in Figure 1—is an extension of the traditional iterative approach. It emphasizes the evaluation of systems by exposing them to real—situated[14]—work practices. The anticipated and intended changes are the starting point of an iteration. These desired changes are further specified, for example, in terms of the effects of using the system. The system (or a part/prototype of it) is then implemented and tried out under conditions as close as possible to real use. Actual use of the system allows for unanticipated changes (both emergent and opportunity-based) to occur. Finally, evaluation of using the system informs subsequent iterations. Thus, selected emergent changes are turned into opportunity-based and new desired changes, thereby forming the starting point for the next iteration.

In the following sections, we describe the sustained Participatory Design approach we propose by presenting an experiment that exemplifies the four elements depicted in Figure 1. The experiment involved the clinical-process module of an EPR system. This EPR module supports clinical documentation and decision-making

13 See, e.g., Gro Bjerknes and Tone Bratteteig, "The Memoirs of Two Survivors: Or Evaluation of a Computer System for Cooperative Work" in *Proceedings of the 1988 ACM Conference on Computer-Supported Cooperative Work*, Irene Grief, ed., (New York: ACM Press, 1988): 167-77; Susanne Bødker, and Jacob Buur, "The Design Collaboratorium—A Place for Usability Design," *ACM Transactions on Computer-Human Interaction* 9, no. 2 (2002): 152-69; Pelle Ehn, *Work-Oriented Design of Computer Artifacts* (Stockholm, Sweden: Arbetslivcentrum, 1988).

14 Lucy A. Suchman, *Human-Machine Reconfigurations: Plans and Situated Action, 2nd Edition* (New York: Cambridge University Press, 2007).

Figure 2
Results from three iterative Participatory Design workshops: mock-up, non-interactive PowerPoint prototype, and running prototype of screen to be used during nursing handover.



and comprises the ongoing documentation of medical patient information made by the clinical staff. Today, the majority of clinical documentation is still paper-based. To initiate the development of this EPR module, a large-scale Participatory Design experiment was conducted during the fall of 2005, involving a close collaboration between CSC, the region of Zealand, the stroke unit at Roskilde Hospital, and the authors. The stroke unit is an acute inpatient clinic with nine beds, and it treats approximately 850 patients a year. The experiment involved one iteration of the sustained Participatory Design approach.

Step 1: Identify the Desired Change

The overall desired change that the experiment aimed for was to implement a fully IT-integrated EPR system that included support for the clinical process and replaced all paper-based patient records. The clinicians at the stroke unit specifically requested improvements in obtaining a patient overview and support of their mutual coordination. On a national level, another long-term aim was to increase the structuring and standardization of the content of patient records as part of the development of the EPR system.[15] In response to this overall political objective, the EPR unit wanted to introduce and evaluate a new structure of the nurses' narrative recordings by dividing it into 14 categories of basic nursing care.[16]

Step 2: Specify and Implement

The desired changes were specified in the first part of the experiment (August to October) through five full-day Participatory Design workshops where clinical staff, in cooperation with designers from CSC and project managers from the EPR unit, designed and configured the EPR system. The main parts of the system were designed and configured in three steps, as depicted in Figure 2: At one workshop, mock-ups were drawn on flip-over charts. At the following workshop, a preliminary, non-interactive PowerPoint prototype was discussed. At a third workshop, a running prototype was demonstrated and discussed. In articulating their requirements, the physicians and nurses focused on two aspects central to their work: their continual creation and re-creation of an overview of the status of the patients and the coordination among the clinicians. The overview and coordination are particularly prominent in relation to three clinical activities:

- *Team conferences.* Every morning on weekdays, the physicians, nurses, and therapists meet for about 15 minutes to go through the admitted patients.
- *Ward rounds.* After the team conference, the chief physician starts the ward round, which consists of medically assessing each patient and adjusting the treatment and care accordingly.

15 Claus Bossen, "Participation, Power, Critique: Constructing a Standard for Electronic Patient Records" in *Proceedings of the Ninth Conference on Participatory Design: Expanding Boundaries in Design* 1 (New York: ACM Press, 2006), 95-104.

16 Virginian Henderson, "Virginia Henderson International Nursing Library," www.nursinglibrary.org (accessed January 22, 2012).

- *Nursing handovers.* At the start of every nursing shift, the nurses meet for about 45 minutes to go through the admitted patients and coordinate activities.

Through the Participatory Design workshops, the clinicians specified a number of desired effects. For example, they requested coordination support during the three activities described. The chief physician wanted to be able to complete the daily ward rounds as a "one-man show" (i.e., without an escorting nurse), where all sharing of information and coordination with other clinical staff were done through the EPR system. This effect was given high priority because the nurses are busy, and time taken to escort the chief physician during the lengthy ward round takes away from patient care. Improved patient overviews were also identified as a desired effect, especially in relation to the team conferences and nursing handovers. In addition, the EPR unit needed the nurses' recordings to follow a more consistent structure and needed prompt system response times to evaluate the performance capabilities from CSC's new configurable development platform.

CSC undertook the technical development of the EPR system in November and December, which included ensuring appropriate interfaces to various systems currently used at the hospital. Five years of patient data were migrated to the EPR system to enable access to previous patient records, as well as to records of patients that would be hospitalized during the experiment. The amount of data also provided a data load that enabled a realistic evaluation of system performance.

Step 3: Real Use Enabling Unanticipated Change

The trial period, where the EPR system was in real use, took place in December and lasted five days. During this trial period, all clinicians at the stroke unit used the EPR system 24 hours a day, and the system replaced all paper records for all patients. The system involved stationary and portable computers, PDAs for bedside measurement of patient parameters, and a large shared display projected on the wall during team conferences and nursing handovers (see Figure 3). Transactions involving other wards not involved in the experiment were simulated by a back office staffed

Figure 3
Photos from the five-day period of real use.

24 hours a day. Patient-record entries that involved paper transactions with other wards were initiated in the EPR system by the clinicians. The back office continuously monitored the system, identified such entries, mailed them in the conventional fashion, waited for the results to arrive, and immediately typed them into the EPR system. Thus, the clinicians at the stroke unit experienced the EPR system as if all transactions were fully IT supported. To safeguard against troubles and misunderstandings, which might have entailed risk to patient health, the clinicians were supported by "shadows" who had detailed knowledge of the EPR system and were present 24 hours a day.

The five-day trial period made it possible to test the EPR system in real use and to identify unanticipated changes. Although the trial period was short, we observed both emergent and opportunity-based changes. Emergent changes included that the traditional oral way of communicating about patient status changed to collectively reading the information on the large shared display used for team conferences and nursing handovers. As a result of the clinicians' ability to read the patient record on the shared display, we further observed that the clinicians initiated collective investigations of the patient record during these activities.[17] We observed that at the nursing handovers before the trial period, the patient record was seen only by the nurse team leader, who held the patient record in her or his hand and conveyed the status of the patient by reading key information out loud. During the trial period, the patient record was projected on the wall and repeatedly inspected by all nurses present at the handovers, and they collectively participated in interpreting the status of the patient.

As an example of an opportunity-based change, the nurses were able to make their observations more visible at the team conferences: Halfway through the trial period, they initiated a change in the team conference screen by having CSC add a panel with nursing observations relevant for the team conference. In this way, the nurses' observations became more salient to the clinicians as they were forming their overview of the patients' status.

Step 4: Evaluate

The evaluation of the desired changes included a quantitative analysis that verified a number of positive effects.[18] For example, the chief physician was able to complete his daily ward rounds without a nurse escort. This result was important to the clinicians. To CSC, the major result of the experiment was the implementation of a fully integrated EPR module that performed well throughout the trial period. Thus, CSC received a valuable reference in proving that it has a highly configurable EPR platform that can deliver satisfying response times. However, the experiment also fostered several new desired changes that were unanticipated and significant.

17 For a detailed ethnographic study of this behavior, see Jesper Simonsen, and Morten Hertzum, "Iterative Participatory Design," in *Design Research: Synergies from Interdisciplinary Perspectives*, ed. Jesper Simonsen et al. (Boston: Routledge, 2010): 16-32.

18 Morten Hertzum, and Jesper Simonsen, "Positive Effects of Electronic Patient Records on Three Clinical Activities," *International Journal of Medical Informatics* 77, no. 12 (2008): 809-17.

To summarize, using the large shared display during the team conferences and nursing handovers resulted in various unanticipated changes: the change from oral presentation to collective reading of patient records, initiation of collective investigations of patient records, and inclusion of nurses' observations as a prominent part of the shared agenda during team conferences. As a direct consequence of the clinicians' requests for coordination support, CSC initiated the design of a completely new EPR module supporting task allocation and management. After the experiment, the nurses requested the addition of more structure to the nursing record. This request resulted from their experiences of how structured nursing observations became part of the agenda during team conferences. This request came as a surprise to the members of the EPR unit, who expected that the nurses would resist rather than request increased structure in their documentation.

Challenges for Participatory Design

We argue that the Participatory Design community should think big by applying a sustained Participatory Design approach to large information systems. Extending the iterative Participatory Design approach beyond initial design (as outlined in Figure 1) raises the overall challenge of how to manage this improvisational and relatively open-ended process. We identify in the following sections four major challenges in managing such a sustained, iterative process.

Creating Appropriate Conditions for Participatory Design

Both customer and vendor need to be motivated and interested in committing to a Participatory Design approach. An *initial challenge, thus, is to obtain the appropriate conditions for Participatory Design*. This necessity might presuppose, for example, earlier experiences and previous collaborations motivating Participatory Design; access to mature, configurable development platforms; and knowledge of other successful Participatory Design projects. In our experiment the customer (the EPR unit) had become ready for a Participatory Design approach through earlier experiences with a drug administration module. The manager of the EPR unit (who had a background as a physician) was further aware that the EPR system supporting the clinical process could not be designed as a one-size-fits-all standard system. The vendor (CSC), on the other hand, had a new and highly configurable EPR platform and an urgent need to prove its ability and to obtain a valuable reference. Finally, the customer and the vendor knew each other from the development and deployment of the drug administration module. This mutual knowledge laid the foundation for the close partnership and collaboration required by the experiment.

Managing a Multitude of Stakeholders

Large-scale information-systems projects are characterized by the involvement of a number of different actors spanning different organizations and different organizational levels. Thus, a second major challenge is to *manage and align the motivations and interests of this multitude of stakeholders*. Traditionally, the focus of Participatory Design projects has been restricted to the relationship between designer and end-users.[19] As a result of our experiment, we can identify the following, broader range of stakeholders:

- Politicians and strategists engaged in health care at a national level (requesting increased structuring and standardization of the EPR content).
- The vendor (needing a reference for another contractual bid).
- The EPR unit (requesting an initial structuring of the nursing record and proof of system performance).
- The management of the stroke unit (requesting improved quality of the reporting to a national clinical research database).
- The physicians (striving to obtain a more autonomous and efficient ward round).
- The nurses (wanting improved overview and coordination during nursing handovers).

The challenge is to comply with the premises and goals set at the national and political levels and by high-level organizational strategists; to align these premises and goals at the different levels represented by the stakeholders; and to argue how Participatory Design, with its direct involvement of end-users, is an effective means to manage, mesh, and meet the needs of these different interests.

Navigating and managing this complex set of multiple stakeholders in a political environment is a major challenge to Participatory Design approaches, as noted in other large-scale projects.[20] In our research, we experiment with using means-end hierarchies, known from cognitive systems engineering as part of a strategic analysis to identify and relate different stakeholders' interests.[21] Using such means-end hierarchies, we might, for example, make the following argument: (1) A national and political demand for increased structure in the EPR system (2) can be met by a stepwise change and incremental increase of the EPR structure, which again (3) can be initiated by introducing structure to the narrative part of nursing records, which (4) can only succeed if the categories fit the nurses' documentation practice, (5) all of which ultimately calls for a Participatory Design approach focusing on the nurses' work practices.

19 Clement and van den Besselaar, "A Retrospective Look At PD Projects;" Oostveen, and van den Besselaar, "From Small Scale to Large Scale User Participation."

20 Bødker et al., *Participatory IT Design*; Oostveen, and van den Besselaar, "From Small Scale to Large Scale User Participation."

21 Jens Rasmussen et al., *Cognitive Systems Engineering* (New York: John Wiley and Sons, Inc., 1994); K. J. Vicente, *Cognitive Work Analysis: Towards Safe, Productive, and Healthy Computer-Based Work* (London: Lawrence Erlbaum Associates, 1999); Bødker et al., *Participatory IT Design*, (especially chapter 5: In-Line Analysis Phase: Strategic Alignment Analysis).

Managing a Stepwise Implementation Process

A third major challenge is to effectively *manage sustained, large-scale, iterative Participatory Design experiments that form an overall stepwise implementation process.* This process includes managing individual Participatory Design experiments, as well as an overall stepwise implementation process that involves a series of such experiments. The latter introduces an important problem of representation: Our experiment was carried out in close collaboration with one clinical specialty. How well the results are transferable to similar specialties at other hospitals remains an open question.

Our Participatory Design approach entails conducting a series of experiments where functional prototypes are evaluated during real use, resulting in a stepwise implementation process similar to the technochange prototyping suggested by Markus.[22] A stepwise implementation process stands in contrast to the traditional way of managing large IT projects as a "design first then implement" process;[23] no iterations or improvisations are incorporated into the prevailing way of conducting competitive bids and formulating IT contracts. The argument for a stepwise process includes emphasizing the problems in the traditional process while pointing to the less risky aspects in a phased implementation process. However, phased implementation also introduces the challenge of managing an implementation process that acknowledges the need for improvisation.[24]

Participatory Design needs a strategy for managing this challenge. In our research, we investigate how to manage a stepwise design and implementation process on the basis of identifying and measuring the effects of using a system.[25] The sustained Participatory Design approach facilitates an iterative process managed on the basis of the effects of using a system: The desired changes can be specified in terms of the effects of the system's use, focusing on the work domain in question (e.g., to be able to complete the ward round alone). We have been successful in convincing managers in both the customer and vendor environment that such a sustained focus on effects is a promising idea and that it potentially leads to an effects-based commercial contract model, where the customer's payments depend on the effects that come from using the vendor's system.[26] This research, however, is a work in progress, and many questions are still unresolved.

Conducting Realistic, Large-Scale Participatory Design Experiments

A fourth major challenge concerns the *methodological question of how to conduct realistic, large-scale Participatory Design experiments* to evaluate prototype systems during real work. Our experiment raises two issues in respect to this challenge: the restricted timeframe for evaluations and the need to safeguard against errors.

22 Markus, "Technochange Management: Using IT to Drive Organizational Change."

23 Ibid., 17.

24 Ibid., 18.

25 Morten Hertzum, and Jesper Simonsen, "Effects-Driven IT Development: Specifying, Realizing, and Assessing Usage Effects," *Scandinavian Journal of Information Systems* 23, no. 1 (2011): 3-28. Hertzum and Simonsen, "Effects-Driven IT Development: A Strategy for Sustained Participatory Design and Implementation," in eds. K. Bødker et al., *Proceedings of the 11th Biennial Conference on Participatory Design: Participation – the Challenge* (New York: ACM Press, 2010): 61-70.

26 Morten Hertzum and Jesper Simonsen, "Effects-Driven IT Development: Status 2004-2011" in *Balancing Sourcing and Innovation in Information Systems Development,* ed. Morten Hertzum and Carsten Jørgensen (Trondheim, NO: Tapir Academic Publishers, 2011): 165-92.

The timing of real-life experiments is a trade-off between two perspectives:

- Evaluating early and quickly to acknowledge project deadlines, save resources, and curtail the diffusion of ineffective systems.
- Evaluating after a longer period of time to allow system errors to be corrected, users to gain proficiency, work practices to stabilize, use situations to reach their true level of heterogeneity, emergent and opportunity-based changes to develop, and long-term outcomes to emerge.

If a Participatory Design experiment is biased toward early and brief evaluation to honor the realities of IT projects, the consequences of various learning effects become critical to the interpretation of the experiment.

In our experiment, the trial period was five days. In this short period of time, none of the clinicians gained proficiency in using the EPR system, and their ways of working were thus in flux; meanwhile, their prior effective use of paper records was facilitated by long-standing work practices. The encouraging element is that some improvements could be identified after using the EPR system for only five days. However, longer trial periods are highly desirable because they, among other things, provide a means of getting beyond the goodwill that can be a factor in trying something new for a restricted period of time.

Special precautions against errors may be necessary to evaluate systems during real use. Participatory Design experiments involve a balancing of the benefits of evaluating prototype systems during real use against the confounding elements introduced because of the necessity of taking special precautions to safeguard against unacceptable errors. While experiments with real use increases validity and the possibility of unanticipated discoveries, special precautions may reduce validity. For safety- or security-critical systems, leaving users to a process of trial and error when they encounter situations not covered by training might not be acceptable. Thus, users must have immediate access to appropriate support during the entire real-use experiment.

In our experiment, the clinicians were supported by shadows, and certain parts of the EPR system were simulated by the back office using Wizard of Oz techniques,[27] where designers from the vendor played the "wizard" by simulating the system's transactions with other wards. These precautions were necessary because troubles and misunderstandings in using the system could have entailed risk to patient health. However, with these precautions in place, the EPR system could replace paper records for the duration of the trial period.

27 David Maulsby et al., "Prototyping an Intelligent Agent Through Wizard of Oz," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM Press, 1993), 277-84.

Conclusion

Participatory Design has achieved an international reputation and application. Nevertheless, its proponents still seem reluctant to engage it in the development of large-scale information systems. Participatory Design undoubtedly has a lot to offer; but as an approach, it also faces considerable challenges in claiming a serious influence on the design and implementation of large-scale information systems.

We have suggested an ambitious and sustained Participatory Design approach, emphasizing that mutual learning situations should be provided during the organizational implementation of large-scale systems. This approach acknowledges the uncertainties of technology-driven organizational change and at the same time poses the challenge of treating the entire design and implementation process as a process of genuine development. Our sustained Participatory Design approach incorporates anticipated changes, as well as emergent and opportunity-based changes, as identified by Orlikowski and Hofman.[28] We argue for large-scale Participatory Design experiments that transcend traditional prototyping tests to evaluate systems as they are exposed to real work situations.

We have reflected on our experiences leveraging Participated Design in the Danish healthcare sector and have reviewed the important lessons learned. Four major challenges have been discussed: the establishment of appropriate conditions for Participatory Design; the handling of the different interests of a multitude of stakeholders; the management of an ongoing and stepwise implementation process, guided by a series of large-scale Participatory Design experiments; and the conduct of experiments during which the system is in real use, although it is still being designed as opposed to deployed.

So far, this approach has yielded promising results in the Danish healthcare sector. However, applying it also forces us to face the challenges described. It thereby raises a number of how-to questions that cannot be satisfactorily answered with general methodological guidelines. What we need is research—preferably action research—that refines this Participatory Design approach by applying it in a number of cases and thus stimulating the mutual creation and sharing of knowledge and experiences.

28 Orlikowski and Hofman, "An Improvisational Model for Change Management."

Lightweight Design Methods in Integrated Practices

Liv Karen Johannessen,
Gunnar Ellingsen

Introduction

The relevance of engaging users in the development of information systems is well recognized. On the one hand, users are expected to provide designers with valuable insight into the users' work practice. On the other, users need an understanding of the technical possibilities and limitations of a new system. This collaboration is facilitated through a range of techniques, spanning from traditional requirement specifications to state-of-the-art, agile methods.[1] Agile methods are seen as "lightweight" methods characterized by short development cycles and by continuous releases of working software. This method enables users to regularly assess and give feedback on the quality of the information systems throughout the whole development process.

As a branch of design studies, the Participatory Design field has been particularly concerned with giving users a direct role in decision making about the development of new systems. Participatory Design generally adheres to "bottom-up" approaches to ensure "empowered" and satisfied users, on the basis of a general belief that this approach leads to better systems.[2] This paper is positioned in this tradition, and, in accordance with the theme of the 2008 Participatory Design conference, "Experiences and Challenges," we call for the Participatory Design field to broaden its range of interest and intensify its research efforts on large-scale integrated systems in complex organizational settings.

The rationale for this call is that the general tendency in the Participatory Design community has been to report on small-scale experimental and prototype-based projects of limited scope and duration.[3] We acknowledge the value of these contributions while also suggesting that they do not reflect the challenges that many current organizations face when implementing new information systems. First, many new information systems presuppose integration with a large portfolio of existing systems. Second, small-scale Participatory Design projects ignore the full organizational complexity of establishing robust and sustainable systems.[4] Because Participatory Design researchers are not active in this arena, their

1 Kent Beck, *Extreme Programming Explained: Embrace Change*, Second edition (Boston: Addison-Wesley, 2004).

2 Jeff Howard, "Toward Participatory Ecological Design of Technological Systems," *Design Issues* 20, no. 3 (2004): 40-53, at 41.

3 Finn Kensing and Jeanette Blomberg, "Participatory Design: Issues and Concerns," *Computer Supported Cooperative Work 7*, no. 3-4 (1998): 167-85, at 179 and Anne-Marie Oostveen and Peter van den Besselaar, "From Small Scale to Large Scale User Participation: A Case Study of Participatory Design in E-Government Systems," in *Proceedings of the Eight Conference on Participatory Design: Artful Integration: Interweaving Media, Materials, and Practices*, 1 (New York: ACM Press, 2004), 173-82, at 174. For concrete examples on small-scale projects, see Erling Björgvinsson and Per-Anders Hillgren, "On the Spot Experiments Within Healthcare" in *Proceedings of the Eight Conference on Participatory Design: Artful Integration*, 93-101; Magnus Irestig, Henrik Eriksson, and Toomas Timpka, "The Impact of Participation in Information System Design: A Comparison of Contextual Placements," in *Proceedings of the Eight Conference on Participatory Design: Artful Integration*, 102-11; Thomas Riisgaard Hansen, "Strings of Experiments: Looking at the Design Process as a Set of Socio-Technical Experiments," in *Proceedings of the Ninth Conference on Participatory Design: Expanding Boundaries in Design*, 1 (New York: ACM Press, 2006), 1-10; and Jesper Simonsen, "Reconfiguring Cooperative Work by Visualizing EPR on Large Projected Screens," paper

valuable insights have less effect. Dan Shapiro argues along similar lines, suggesting that the Participatory Design community establish a program of action to achieve more influence in this more complex area.[5] In addition, because of the narrow, small-scale nature of many Participatory Design projects, the political dimension of design and implementation is increasingly neglected. This lack of attention marginalizes one of the key foundations of the Participatory Design field: its political heritage.[6]

The aim of this paper is to contribute to an understanding of how Participatory Design plays out in emerging, large-scale information systems projects. We argue that even if many of these projects start out on a well-founded, small-step methodological basis, such as agile methods, complex organizational issues inevitably become part of the process, especially as the scope and size of the system increase. More specifically, we discuss this implicated infrastructural complexity as the system scales up, recognizing the challenge of mobilizing participation in an integrated environment. We also critically examine the traditional neutral vendor role, which is an assumption of agile engineering methods.

Empirically, we focus on the design and implementation of the DIPS Interactor—a system that makes it possible for general practitioners (GPs) to electronically order analyses from hospital laboratories. The system was developed by the vendor DIPS, in close collaboration with GPs in the North Norwegian health region and the University Hospital of North Norway (UNN). We elaborate on the conditions for user involvement in the project as the DIPS Interactor evolved from a local, small-scale system with a few GPs and one laboratory to include many GPs, laboratories, and hospitals.

Information Systems Development and Participatory Design

The social character of the design of technical systems is emphasized in several studies.[7] On the one hand, social processes shape the designers' assumptions about future use, leading to technical design decisions. On the other, they shape how users perceive, use, and potentially reject a new technology. Hence, the relationship between designers and users embodies deep assumptions about the relationship between the technical and the social.[8] Not surprisingly, then, a recurrent concern in many projects for information systems development has been to determine a strategy for interacting with the users. Traditionally, the waterfall model has been applied to the process of developing information systems,[9] unfortunately leaving a less influential role for users. Here, customers specify in advance what they need, and then the designers develop the system according to what is specified. User involvement is limited to providing input to the initial requirement specification. An

presented at the PDC 2006 Workshop on Reconfiguring Healthcare: Issues in Computer-Supported Cooperative Work in Healthcare Environments, Trento, Italy, 2006.

4 Finn Kensing and Jeanette Blomberg, "Participatory Design: Issues and Concerns," 179.

5 Dan Shapiro, "Participatory Design: The Will to Succeed," in *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility* (New York: ACM Press, 2005), 29-38, at 33.

6 See, e.g., Gro Bjerknes and Tone Bratteteig, "User Participation and Democracy: A Discussion of Scandinavian Research on System Development," *Scandinavian Journal of Information Systems* 7, no. 1 (1995): 73-98, at 74; Eevi E. Beck, "P for Political: Participation Is Not Enough," *Scandinavian Journal of Information Systems* 14, no. 1 (2002): 77-92, at 79; and Jørgen Bansler, "Systems Development Research in Scandinavia: Three Theoretical Schools," *Scandinavian Journal of Information Systems* 1, no. 9 (1989): 3–20, at 13.

7 For examples, see Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, MA: MIT Press, 1999); Ina Wagner, "A Web of Fuzzy Problems: Confronting the Ethical Issues," *Communications of the ACM* 36, no. 6 (1993): 94-101; Jeff Howard, "Toward Participatory Ecological Design of Technological Systems," *Design Issues* 20, no. 3 (Summer 2004): 40-53; and Esko Kurvinen, Ilpo Koskinen, and Katja Battarbee, "Prototyping Social Interaction," *Design Issues* 24, no. 3 (Summer 2008): 46-57.

8 Jeff Howard, "Toward Participatory Ecological Design of Technological Systems," 40.

9 Kalle Lyytinen, "Different Perspectives on Information Systems: Problems and Solutions," *ACM Computing Surveys* 19, no 1 (1987), 13.

obvious disadvantage with this method is therefore that it allows little flexibility for changing the course along the way, based on design suggestions from users.

In contrast, agile methodology is a conceptual framework for software development that has evolved as a reaction against "heavyweight" methods like the waterfall model.[10] While traditional waterfall methods are seen as bureaucratic and slow, agile methods are seen as the opposite. The idea is that short iterations make the methods receptive to changes in the environment. An agile approach implies that the developer gives high priority to satisfying the users' needs through early and continuous delivery of valuable software, where changes of requirements are welcomed. The method shares some features with prototyping, such as sketching ideas for user interfaces on paper or computer screens. However, a crucial difference is that, while prototyping generally involves representations of a design made *before* final artifacts exist,[11] agile methods aim to create working software already from the first delivery. Two major agile methods are Scrum and Extreme Programming (XP). Scrum focuses on project management in situations where it is difficult to plan ahead. XP focuses on best practices for development—for instance, by being responsive to changes in the environment and developing only what is needed at that time. The planning and design process consists of small releases and iterations that take from one to four weeks. This process is informed by so-called user stories, which are informal descriptions of feature requests written and prioritized by the customer. As in Participatory Design, involving users in agile methods is considered very important for obtaining good functionality.[12]

However, health organizations today increasingly have to deal with a complex, integrated portfolio of information systems that support many different cross-organizational practices and thus a heterogeneous array of users. The notion of information infrastructure is a promising framework for analyzing these large-scale systems, which are deeply embedded in different practices.[13] An *infrastructure has reach beyond a single event or on-site practice*.[14] Accordingly, practices are interconnected with each other to a high degree, through both manual procedures and various information systems. This interconnectedness makes it nearly impossible to focus on only one of these systems in (Participatory) Design phases. Another important aspect of information infrastructures is that an existing portfolio of information systems (the installed base) *heavily influences how a new infrastructure can be designed*.[15] Many of these systems have different vendors and users, who

10 Kent Beck, *Extreme Programming Explained*, 1.

11 Kurvinen et al., "Prototyping Social Interaction," 47.

12 Markus Rittenbruch, Gregor McEwan, Nigel Ward, Tim Mansfield, and Dominik Bartenstein, "Extreme Participation – Moving Extreme Programming Towards Participatory Design" in Proceeding of Participatory Design Conference PDC 2002: Inquiring Into the Politics, Contexts and Practices of Collaborative Design Work (Palo Alto, USA: Computer Professionals for Social Responsibility, 2002): 29-41, at 29.

13 See Susan Leigh Star and Karen Ruhleder, "Steps toward an Ecology of Infrastructure: Design and Access for Large Information Spaces," *Information Systems Research* 7, no. 1 (1996): 111-34, at 113; and Ole Hanseth and Kalle Lyytinen, "Theorizing About the Design of Information Infrastructures: Design Kernel Theories and Principles," *Sprouts: Working Papers on Information Environments, Systems and Organizations* 4, no. 12 (2004): 207-41, at 208.

14 Bowker and Star, Sorting Things Out, 35.

15 Hanseth and Lyytinen, "Theorizing about the Design of Information Infrastructures," 210.

potentially have varied agendas that may diverge from the overall goal in new design projects. In total, this may influence the extent to which Participatory Design is possible.

This perspective also challenges the traditional and relatively homogeneous user role—a key characteristic of the Scandinavian Participatory Design tradition. Historically, this approach has considered participation a political instrument in the working class struggle between management and workers, often referred to as the Scandinavian or critical tradition.[16] User participation is therefore seen as an instrument for maintaining and increasing workplace democracy.[17] Presumptions for this approach included relatively homogenous workforces, a high level of unionization, and strong national trade union federations that could play an active role.[18] Instead of considering Participatory Design as a two-sided struggle between a homogeneous user group and managers, users should instead be recognized as having specific goals that reflect the different practices they come from,[19] especially because different users are expected to work together across organizational boundaries using infrastructural systems. Bowker and Star remind us that users from different practices need to negotiate and compromise to reach an agreement on the use of certain technologies.[20]

Method

Our research was mainly carried out at both Well Diagnostics, later renamed DIPS, and the University Hospital of North Norway (UNN). Well Diagnostics, a small company with 14 employees, specialized in systems for communicating and interaction across organizational boundaries in Norwegian healthcare. During the course of this study, the company was bought by the larger vendor, DIPS, and the name DIPS is used for both the company and the product throughout this paper. UNN is the largest hospital in the northern region of Norway, with approximately 5,000 employees and 600 beds. The hospital has seven laboratories that conduct approximately 3 million analyses a year.

The study adheres to an interpretive research approach.[21] Data were gathered from December 2007 to March 2008 and consist of participant observations (work settings and project meetings), interviews, and informal discussions. The authors conducted eight in-depth semi-structured and unstructured interviews with members of the development team, as well as with pilot users in the hospital and in general practice. The first author had an office in DIPS, allowing her to participate in informal discussions (e.g., on lunch breaks), which facilitated awareness of emerging situations and issues.

16 Jørgen Bansler, "Systems development research in Scandinavia: Three theoretical schools," *Scandinavian Journal of Information Systems* 1 (1989): 3–20, at 13.

17 Enid Mumford, "Participation—from Aristotle to Today" in *Beyond Productivity: Information Systems Development for Organizational Effectiveness*, T. M. A. Bemelmans, ed., (North-Holland, 1984): 95-104.

18 Pelle Ehn, "Scandinavian Design: On Participation and Skill" in *Participatory Design: Principles and Practices*, Douglas Schuler and Aki Namioka, eds. (Hillsdale, New Jersey; Lawrence Erlbaum Associates, Inc., 1993): 41-78, at 43.

19 Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999).

20 Bowker and Star, *Sorting Things Out.*

21 Heinz K. Klein and Michael D. Myers, "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems," *MIS Quarterly* 23, no. 1 (1999): 67-94, at 70.

Establishing Electronic Laboratory Requisitions from GPs to Hospital Laboratories

*The DIPS Interactor projec*t

An internal investigation at UNN, completed in 2002, revealed that the paper-based laboratory requisitions from GPs in the North Norwegian health region often contained errors or lacked clinical information about the particular case. A mismatch often arose between the content of the paper-based requisition and that of the sample tube. In addition, manual and repetitive work in receiving the samples was considered a waste of resources. Because there were 180 GP practices in total, often with many GPs in each practice, UNN saw great potential in receiving the requisitions electronically. Accordingly in 2006, UNN initiated a two-year project with the vendor DIPS, with the aim of designing a system for electronic requisition of laboratory requests. The system was called DIPS Interactor and enabled GPs to choose and order laboratory services directly from their computer. An essential part of the design strategy was to integrate DIPS Interactor with the portfolio of laboratory systems in the hospital, as well as with the GPs' electronic patient records. In the process of laboratory ordering in the GP practice, the system printed labels with a barcode to be glued onto the sample tube. The GPs sent the sample tubes using the regular postal mail or a delivery service, and when the tubes were received at the laboratory, the barcodes on the sample tubes were scanned, enabling access to the electronic requisition.

In the following sections, we focus on how user involvement evolved in the three different phases of the development of DIPS Interactor. Initially, the project was fairly small, comprising only a few manageable user groups. Later, as the vendor experienced increasing success with DIPS Interactor in the healthcare market, new levels of complexity emerged, resulting in new levels of challenges regarding the users' influence.

First Phase: Starting from Scratch

In their agile development approach, DIPS worked in three-week iterations, and new versions were downloaded to the users every three weeks. The first step in an iteration was to collect user stories and estimate the work involved in making the features that the user stories described. According to agile methodologies, user stories are to be written and prioritized by the customer and serve as a communication channel between developers and customer. In the agile methodology, the "customer" generally is understood to be the actual user of the system. DIPS produces user stories in a slightly different manner, basing them on requests or feedback from the users, but letting the development team formulate them.

On the hospital side, a user group consisting of physicians and bioengineers from the Medical Biochemistry laboratory worked closely with the vendor. On the primary care side, the user group included GPs, their secretaries, and local laboratory personnel. The GPs in particular were identified as key participants because the success of the project depended on their daily use of the system. A complicating factor in creating the new system, however, was that most GPs in Norway are private businesses, and new technology that does not benefit the GPs directly is more likely to be rejected. Accordingly, the GPs had to be recruited carefully, based on both their previous interest in such projects and their proximity to the vendor and the hospital. In total, 4 GP practices with a total of 26 ordering physicians in the area around UNN, were recruited to pilot the system from an early stage of the development.

With the development of the DIPS Interactor, the vendor could for the first time implement full-scale use of agile methods from the start of the design process. After a short initiation period of four months, DIPS started to make the very first version of the DIPS Interactor. The choices about the first functionalities and user interface were made after discussions among the members of the project group, and the solution was very simple, satisfying the minimum requirements for sending an electronic requisition:

> Make it as simple as possible to illustrate the intentions. When the users start using it, they will see how this suits their daily work, and they will correct us and give feedback on how it should be. (Designer, DIPS)

For the GPs, features such as data security, resemblance to paper-based requisitions, easy access to electronic patient records, electronic receipt of sent requisitions, status messaging, and access for all user groups proved to be important. In an iterative way, new functionalities and user interfaces were added or changed, based on the feedback stemming from the actual use; gradually, the resulting product was fully integrated with the GPs' electronic patient record, so that only a few extra clicks were needed to produce and send laboratory requisitions. Although time consuming, this part of the design process was relatively straightforward. This progress was auspicious, in that one of the key problems DIPS encountered when involving users from general practice was their limited availability for participation in the design process. Because GPs' earnings depended on patient consultations, participation in design projects resulted in a loss of income for them. DIPS therefore decided to pay the GPs on an hourly basis to participate in the first phase of the design project. Subsequent involvement has been based on GPs' interest in the product and willingness to leave their workplace for short periods.

Second Phase: Encountering a New Level of Complexity in the Laboratories

After the initial phase, the designers encountered a much more complex situation in the hospital laboratories. The different laboratories at UNN had different laboratory information systems, making it necessary for DIPS to collaborate with the vendors of these systems to establish a well-functioning integration for the DIPS Interactor. Basically, DIPS depended on the adaptation by the other vendors of their systems, and this adaptation was not always given priority. For instance, when the microbiology laboratory was to be integrated with the DIPS Interactor, the vendor of the microbiology system encountered delays in receiving the parts of the systems that were needed for using electronic requisitions. Another vendor had shifted its priority to upgrading other parts of the system. This reprioritizing and delays caused some frustration among the DIPS designers. One of them complained:

> …they [the other vendors] have their own agendas and their own products. And we, who have to make it work together, are often dependent on their priorities. That is the problem: to get a reaction from the vendors. (Designer, DIPS)

After the microbiology laboratory was included, another complex issue emerged. Managers of the laboratory saw the potential for using the DIPS Interactor to control the volume of requisitions from the GPs. In Norway, GPs have a reimbursement system that provides incentives for ordering more laboratory tests; hence, these users wanted a system that would make it as easy as possible for them to order laboratory tests. In contrast, the hospital laboratories are financed mainly through a general grant, and an increase in laboratory orders from the GPs increases the costs to the laboratories but not their income. As a result, the hospital wanted to receive fewer orders from the GPs, and the laboratory staff wanted to incorporate a message showing the hospital's cost for each analysis that the GP ordered in the system. The intent was to encourage GPs to think twice before ordering particularly costly analyses. The laboratory staff's goal generated much resistance among the GPs, and ultimately the vendor sided with the GPs, which effectively terminated the idea. One of the designers commented:

> If we use two months to enforce some functionality requested by the laboratory, but that we know will meet resistance out there [in primary care], then it is wasted. (Designer, DIPS)

Moreover, the different practices in the medical biochemistry and microbiology laboratories resulted in different requirements for the design of the requisition forms. These design schemes contain

the analyses offered by the laboratories and appear in the GPs' user interface in the ordering process. While the medical biochemistry laboratory required a minimum of clinical information from the ordering physicians, the microbiology laboratory required extensive clinical information. The different requirements, in turn, required that the requisition schemes and the presentation on the GPs' screens could be tailored to each laboratory's need. The medical biochemistry laboratory started out as the first laboratory, and the vendor edited the requisition schemes manually. However, when the microbiology laboratory was about to start, the vendor realized the need for a more flexible editing tool—one that would allow each laboratory to design the requisition schemes and presentation on the screen to suit its specific needs. The vendor therefore devoted considerable resources to developing such a tool. Nevertheless, the users in the laboratories faced some core challenges in the design of the requisition schemes. They had to define the content of the requisition schemes, but they did not know how this information could best be presented to match the GPs' work process. However, because the GPs were not a homogenous user group, they had different ideas about how the offered services should be organized. Some GPs preferred a structure corresponding to the former paper-based ordering forms; others preferred a layout based on organs of the body, while others suggested a completely new structure enabled by the new technology.

Third Phase: Commercialization and Increased Distance from the Users

The number of users has been increasing, and 13 offices in the northern health region presently use the DIPS Interactor to order laboratory services electronically at UNN. In addition, nine other Norwegian hospitals, including each hospital's associated GPs, have started to use the system.

The escalation of the product scope required extensive cooperation between the vendor and several general practices, hospitals, and other vendors. It also required cooperation among the different actors in the healthcare organizations. The new customers (the nine other hospitals) bought what had been developed at the time of purchase, and from then on, they were part of the further design of the system. This larger market imposed new challenges for the vendor because there were several new customers to relate to and a much larger number of users. Faced with a system that included many different user groups, each with different ways of using the system and limited time to spend on design, the development team needed to find ways to enable all users' voices to be heard. More people at DIPS needed to get involved, especially in the marketing group. For each customer, DIPS appointed an internal project leader for the adjustments and implementation phase. The project leaders stayed in close contact with their customers

and took care of technical problems, as well as acting as the customer proxy in the development team. This process was challenging, as the person responsible for marketing of DIPS recalled:

> When we started out at the University Hospital of Akershus, I had a hotline to the designer 24 hours a day because I did not know the product. There were so many errors that we did not foresee, but we learned. Now I feel that I can manage much more on my own.

Still, the marketing people did not have detailed technical knowledge of the system and encountered challenges in responding to users' problems. The long-term consequences were that the users increasingly lost contact with the developers, which diminished the users' ability to influence the process.

The large number of users resulted in an increasing number of new user stories. Some stories were of general interest while others were based on the specific needs of one particular user. The designers also had to make choices between user stories that entailed new functionalities the customers would pay to get, and improvement of old ones with no incoming cash flow. Although the users thus far have been able to contact the designers or marketing people directly with feedback or needs, the need might soon arise for a system that allows user proxies (e.g., marketing personnel) to collect and refine user stories before they go to the design team for development. This change would increase the distance between users and designers even more.

Discussion

Complex Organizational Issues: Limitations for Participatory Design

In many organizations, new information systems are supposed to be integrated and able to play along with the organizations' existing information systems portfolios. This need for compatibility implies that existing technological and organizational constraints might shape the design flexibility of the new system—and consequently, the degree to which Participatory Design is possible.[22] In this project, as the scope of the DIPS Interactor project grew, such consequences became apparent. Over several years, the laboratories at UNN had built up a well-functioning laboratory infrastructure with a high degree of integration and mutual dependencies among different laboratory systems, analysis machines, procedures, and more. This complexity made it nearly impossible for single user groups to have a full overview of the possibilities, the constraints, and not least, the consequences of user requests. Consequently, because of the inter-organizational scope of the project, maintaining this overview was very much up to the vendor, DIPS, and not up to the users. Also hampering user participation was

22 Bowker and Star, *Sorting Things Out*, 35 and Hanseth and Lyytinen, "Theorizing about the Design of Information Infrastructures," 214.

that a well-functioning DIPS Interactor depended on integration with different systems delivered by other vendors. These vendors did not share the interest of DIPS in attending to the DIPS Interactor users; instead, they were primarily concerned about their own market segments and completely different user groups. The extent to which these vendors implemented anything resulted not from the requests of the users of the DIPS Interactor, but rather from their collaboration with the product's vendor. In addition, because several user groups were involved, that users in these different groups would be granted the influence they wanted was far from a given. Sometimes the interests of these different users were directly opposed to each other, including when the many user groups in the GP practices had different preferences for the layout of the requisition schemes designed by the laboratory users. A final point is that on the way to commercialization of the DIPS Interactor, many new hospitals and practices have been involved, thus building a larger user mass. This growth has increased the pressure on the vendor to handle a larger number of user requests. The vendor has responded to this demand by building up an organization and an infrastructure to receive and coordinate these requests. This capability obviously is necessary, but at the same time, it creates greater distance between the vendor and the users, making the vendor's agile approach more difficult.

The Challenge of Mobilizing Participation in an Integrated Environment

A cornerstone of Participatory Design is to include users in the decision-making for the design of new systems.[23] However, this goal presupposes that the users are interested in taking part in the process, which basically reflects the extent to which users find the new system beneficial. When a system is developed for a single work practice, the benefits for users might be quite clear. In contrast, in an inter-organizational setting with many stakeholders, the benefits may not be evenly distributed, inducing some user groups to question whether participation is worthwhile.

In this project, the users in the laboratories were easy to engage because they saw the potential for quality and efficiency improvement. This interest was also reflected in the fact that the hospital staff had initiated the project, together with the vendor. In contrast, the vendor experienced greater difficulty in involving the GPs—not because the GPs did not find the DIPS Interactor useful, but simply because they did not find it useful enough. Norwegian GPs are self-employed, and time spent participating in the project meant lost income. To handle this situation, the vendor chose to pay out of its own pocket to compensate them for participating. Although this approach ensured that knowledge about the GPs' practice was conveyed to the designers, it simultaneously raised

23 Bjerknes and Bratteteig, "User Participation and Democracy, 73 and Bansler, "Systems Development Research in Scandinavia.

some critical issues about the degree of user influence: If users are paid to participate, how much influence do they really have? Because of both the compensation and the fact that the hospital was the actual customer, the conclusion might be that GPs had little real influence. Consider an observation from one of the designers in DIPS, who clearly ascribes the central power to the hospital:

> It is business, of course. If the hospital is very strict on what they want, and has paid for the solution, then we have to yield. (Designer, DIPS)

Still, the situation is more complex than this observation suggests. Although the laboratory staff ostensibly exercised greater influence over the design of the DIPS Interactor than the GPs, the hospital still depended on the GPs to *use* the system. In this sense, the GPs exercised substantial influence in relation to the laboratories because they could send their laboratory requests to other hospitals if they were dissatisfied with the services the hospital provided through the DIPS client. Accordingly, the laboratory staff had to design the requisition schemes in line with what the GPs wanted. In this way, the user and designer roles were not explicitly given but entailed more of a relational approach.[24] For instance, the laboratory staff had both a user role and a designer role, depending on the ones with whom they were interacting.

The Vendor Role: Taking a Stand on Organizational Consequences

According to agile development methods, the customer is the one making and prioritizing user stories, leaving vendors in a neutral position in which they design what the customer or users want, within the range of what is technologically possible. This position is challenged in many science and technology studies, as well as in the Participatory Design research community.[25] We believe that the political aspects come to the fore as the design projects grow in size and scope and that these political aspects also become more apparent in the case of the vendor role:

> There are examples where the hospital has made an organizational change and we [the designers] find ourselves in the middle of debates about personnel in the hospital. (Designer, DIPS)

Accordingly, different and potentially conflicting issues force vendors to take a stand and side with specific user perspectives. One illustration of such a situation is when the microbiology laboratory wanted to include a feature in the system presenting the costs of expensive analysis to the GPs before the GPs could order the analysis. Although this feature made perfect sense for the laboratory carrying the financial burden, the GPs felt that it represented a

24 Latour, *Pandora's Hope.*

25 Wagner, "A Web of Fuzzy Problems," 100.

kind of monitoring of their work that they did not want. In this case, the vendor sided with the GPs and convinced the laboratory not to insist on this feature. One of the designers at DIPS elaborated on what he perceived the vendor's role to be in such matters:

> We are not impartial; we listen to the arguments and decide what sounds reasonable. Then one may lobby for one or the other [...] Then it becomes our role as mediator in the middle to try to tell them what is the most convenient thing to do.

Consequently, vendors have to maneuver carefully among different user groups, sometimes serving as a go-between and sometimes siding with one of the groups. This mediation role imposes a particular responsibility on vendors to understand the different perspectives and to try to find a middle way. Of course, vendors also must recognize an issue of self-interest. They know that ensuring that all user groups in an integrated setting are satisfied is important for them to keep their product in the market. If one of the groups (e.g., the GPs) refuses to play its part in an integrated environment, the value for the other participant is at risk, clearly highlighting that a networked environment is not stronger than its weakest link.[26]

Conclusion

The aim of this paper has been to elaborate on some of the challenges of involving users in the design of evolving information systems, including challenges for vendors committing themselves to agile methods. We have shown that mobilizing the users in the design process can be a challenge in itself, particularly when a system spans several organizations and when only one of these organizations is the actual customer of the system. We have also shown that Participatory Design can be a challenge when the system in question has to be integrated with other systems. In addition, as development projects and systems increase in size and scope, we also believe that the neutral vendor role ascribed in agile methods vanishes. Throughout the design process, vendors sometimes have to deal with problematic organizational issues and consequences. On this basis, we promote *design* as an activity that is collectively negotiated among many stakeholders. Here, the roles between designers and users are not automatically given or fixed but depend on the mutuality of the relationships among the stakeholders. In turn, the nature of the roles can vary, depending on the phase of the design process, possibly resulting in greater influence given to users in the early stages and less in later ones.

26 Bruno Latour, *Science in Action* (Harvard University Press, 1987), 124.

Participatory Design in Large-Scale Public Projects: Challenges and Opportunities

Peter Dalsgaard

Introduction

In the years since methods for involving potential end-users as co-designers in systems development were first introduced in the 1970s and 1980s, Participatory Design has grown to become an established field of practice and research. Participatory methods and techniques currently are employed in a range of projects, spanning from software development to urban planning. However, Participatory Design approaches have primarily been used in projects that concern the development of individual systems, services, or products. In *A Retrospective Look at PD Projects*, Clement and van den Besselaar find that, with few exceptions, early Participatory Design projects "...were generally small-scale and isolated from other levels of the host and sponsoring organization."[1] These findings are echoed by Simonsen and Hertzum: "[...] a review of the PD literature reveals that most PD experiments have been restricted to small-scale systems (often driven by researchers) or to the initial parts of larger scale information systems development followed by a conventional contractual bid."[2] In light of this situation, Shapiro poses the challenge that "Participatory Design as a community of practitioners should seriously consider claiming an engagement in the development of large-scale systems, and more particularly an engagement with the procurement and development of systems in the public sector."[3]

In this paper, I examine a specific large-scale public project—the development of a new municipal library titled Mediaspace—from a Participatory Design perspective. My aim is to outline central challenges and opportunities for participation in large-scale public projects. In doing so, I address the role that participation can play in such projects and how insights and approaches from Participatory Design can be appropriated for them. The scale and scope of the Mediaspace project extends beyond many traditional studies of Participatory Design projects in that it deals not with the development of a single technological system, but with the transformation of a large public institution. This transformation has a dual nature: It concerns the development

1 Andrew Clement and Peter van den Besselaar, "A Retrospective Look at Participatory Design Projects," *Communications of the ACM* 36, no. 4, (1993): 32.

2 Jesper Simonsen and Morten Hertzum, "Sustained Participatory Design: Extending the Iterative Approach," *Design Issues* 28, no. 2 (Spring 2012): 11.

3 Dan Shapiro, "Participatory Design: The Will to Succeed," In Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility (CC '05), Olav W. Bertelsen, Niels Olof Bouvin, Peter G. Krogh, and Morten Kyng, eds., (New York, NY: ACM), 32.

of a new building to house a library, but it also deals with the transformation that the library as a socio-cultural institution undergoes. These developments are intertwined in the sense that the new building that houses the library must necessarily reflect the ways in which the library as an institution is challenged and transformed by the emergence of new digital technologies that supplement or supplant the existing media the library originally was developed to house.

The challenges that this particular library faces resonates with the challenges of other libraries, as well as with those of other public knowledge institutions, such as museums and science centers in general. These institutions historically have held a privileged position as repositories for and disseminators of information; however, new digital technologies provide access to this type of information and challenge the roles and positions of these institutions in society.[4] For this reason, many public knowledge institutions are thrust into an identity crisis, as well as an arguably more tangible crisis of retaining and attracting visitors and funding. These changes have prompted institutions to consider how to integrate emerging digital technologies into their services, as well as to examine and articulate the roles that these institutions themselves play in society—in addition to being repositories of physical media and artifacts.[5] For many institutions, the case is that they play important roles in the public sphere not only due to the materials they house and curate, but because they have also become bearers of culture and places of public engagement and participation.

In my examination of the Mediaspace project, I focus on the challenges that a project of this type entail, as well as the design opportunities that it offers. Design practitioners and researchers who use and explore participatory approaches are likely to find the case relevant for the following reasons:

- It addresses the complex process of *involving citizens and stakeholders* in the co-design of a public institution and, by association , in the exploration of how new technologies affect the role and services of the institution.
- It addresses the ways in which both *methods* and *values* of Participatory Design can play a role in large-scale public projects.
- It addresses the ways in which *new technologies* can be designed and employed to inspire and scaffold participation in the design process.
- On a more overarching level, it addresses the *reciprocal transformation processes* that technologies and institutions undergo, in the sense that an institution like the library is challenged by the emergence of new digital technologies but can at the same time play a role in the shaping of such technologies.

4 Nancy Courtney, *Library 2.0 and Beyond: Innovative Technologies and Tomorrow's User*. Portal Libraries and the Academy. 8. (Libraries Unlimited). www.loc.gov/catdir/toc/ecip0713/2007009007.html (accessed March 8, 2012).

5 See Eilean Hooper-Greenhill: *Communication and Communities in the Post-museum – From Metanarratives to Constructed Knowledge* (Leicester: University of Leicester 2001). Online papers: www.le.ac.uk/ms/study/paper3.pdf (accessed March 8, 2012).
P. Vergo, *The New Museology* (London: Reaktion Books, 1997).

Figure 1
Rendering of the Future Mediaspace Building, Aarhus, Denmark (http://www.multimediehuset.dk).

The Mediaspace Project

Mediaspace is a large-scale project to develop a shared building for the municipal library and Citizens' Service department in Aarhus, Denmark. The project, which has a total budget of €200 million (apx USD $254,096,834), was initiated in 2005 and is scheduled for completion in 2015. The project has moved through initial stages of articulating central values and visions to guide the project, idea development, process planning, establishment of stakeholder networks, development of a program for an architectural competition, and in 2009, the selection of the winning consortium to construct the building and its environs. The architectural proposal is being further developed, and tenders for contract work are under consideration. During the remainder of the process, the construction will take place alongside continued investigations into the services that should be housed in the Mediaspace (see Figure 1).

Our research group has orchestrated a series of Participatory Design workshops concerning the development of Mediaspace since 2009. We became involved in the project through an existing partnership with the municipality in the Center for Digital Urban Living, a research initiative exploring the ways in which digital technologies transform the life in and of the city. Because the Mediaspace project is central to the municipality's digital strategy, our collaboration in the project as interaction design researchers involved facilitating investigations into the integration of interactive technologies into the Mediaspace building. We, thus, arranged a series of events with Mediaspace stakeholders, many of which centered on participatory activities. (See the section titled "Participatory Activities in the Mediaspace Project" which expands on several of these activities.)

Our current knowledge of the Mediaspace project and the process comes from several sources: (1) We have "insider" insights from the Participatory Design activities we have orchestrated for the project; (2) we have held a number of meetings and conducted

interviews with the Mediaspace project manager and stakeholders, including citizens, architects, contractors, library staff and management, and others; (3) we have to varying degrees taken part in other citizen involvement activities in the project, both before and during our own involvement as researchers, and we have discussed many of these activities with the responsible organizers; and (4) because of the public nature of this project, we have had access to its extensive documentation that is available to the public.[6] On this basis, we have approached the project from a Participatory Design perspective to use it as a case for studying the challenges and opportunities of participation in large-scale public projects. In the following sections, I present two aspects of the project that are of special relevance from this perspective: The first explores the notion of participation as a core value and project driver; the second describes a series of Participatory Design activities executed for the project. A third section discusses three concerns regarding the challenges and opportunities for participation in a project of this type.

Participation as a Central Value and Project Driver

The decision to establish the Mediaspace project rests on the municipality's political visions to establish Aarhus as a city of knowledge, in conjunction with the awareness that emerging digital technologies are transforming the role of libraries in society. Since the project's inception in 2005, citizen involvement and participation has been articulated as a central value and driver of the project. The manager of the Mediaspace project presents the participatory agenda in the following way: "Mediaspace must be built, established, and formed by the people who are going to use it in the future. Those people are all of our users, all the citizens of Aarhus, our staff, our stakeholders, our network and partners... Mediaspace should be a remarkable icon of collaboration."[7]

One of the reasons that Participatory Design continues to play a part in new design projects is that it is arguably more than a collection of techniques; it also represents a shared set of concerns and values that connect existing techniques, and that are vital and malleable enough to embrace new challenges and inform new techniques for addressing these challenges. The Mediaspace project is set in Scandinavia, and it is therefore pertinent to consider it in light of the Scandinavian systems development tradition. In this tradition, political ideals and values permeated many early contributions. Ehn and Kyng summarize these ideals as quality of work and products, democracy at work, and education for local development.[8] More recently, Iversen et al. have revisited the values laid out by Ehn and Kyng and argued for revitalizing them to fit contemporary challenges, thus reformulating them as quality in

6 All public documents pertaining to the Mediaspace project are available online at www.urbanmediaspace.dk/en (accessed March 8, 2012).

7 Aarhus Municipality website, www.multimediehuset.dk/sw3056.asp, translated from Danish by the author (accessed December 10, 2011).

8 Pelle Ehn and Morten Kyng, "The Collective Resource Approach to Systems Design," in *Computers and Democracy: A Scandinavian Challenge*, G. Bjerknes, P. Ehn, and M. Kyng, eds., (Aldershot, England: Avebury, 1987), 17-57.

product and process, emancipatory potentials for the involved stakeholders, and democracy–which now extends beyond traditional concerns for workplace democracy and into society at large.[9]

Although I do not consider the Mediaspace project a Participatory Design project in the traditional sense of the term, it is a project in which both the values and the techniques from Participatory Design play a central role. One of the first steps in the project was to schedule a series of participatory events involving citizens, experts, cooperation partners, networks, employees, and other interested parties. These events resulted in the articulation of seven core values to be explored as part of the development process and ultimately to be incorporated into the Mediaspace institution: (1) The Citizen as Key Factor; (2) Lifelong Learning and Community; (3) Diversity, Cooperation, and Network; (4) Culture and Experiences; (5) Bridging Citizens, Technology, and Knowledge; (6) Flexible and Professional Organization; and (7) Sustainable Icon for Aarhus.[10] This set of articulated values resonates well with the values of quality, emancipation, and democracy inherent in the Participatory Design tradition. For example, both The Citizen as Key Factor and Diversity, Cooperation, and Network emphasize the democratic ideals of the library; Lifelong Learning and Community and Culture and Experiences point to the emancipatory potential for citizens through learning and cultural development. In addition, Bridging Citizens, Technology, and Knowledge; Flexible and Professional Organization; and Sustainable Icon for Aarhus each address the concern for quality in process and product. The seven values have subsequently served as guidelines for the development of the project. Potential contractors have had to explain in detail how they would involve the stakeholders and potential end-users of the project in their specific development processes, and these proposed involvement processes have played an important role in the selection of contractors. For example, the competition brief for the architectural competition explicitly states that the proposals also will be judged on the basis of how the seven values are addressed in the architectural process: "The values will be parameters in determining whether the project and Mediaspace are conducive to the realization of the vision."[11]

Participatory Activities in the Mediaspace Project

Because of the emphasis placed on participation by the Mediaspace developers, a large number of participatory initiatives have already happened, and still more are planned for the years to come. These initiatives have addressed both the building process and the changes for the library as an institution brought on by new digital technologies. The initiatives fall into several different categories: Some use conventional methods for public involvement,

9 Ole Iversen, Anne Marie Kanstrup and Marianne Graves Petersen, "A Visit to the 'New Utopia:' Revitalizing Democracy, Emancipation and Quality in Co-operative Design," in *Proceedings of NordiCHI 2004* (New York: ACM Press, 2004): 171-79.

10 Søren Holm, *Mediaspace–Core Values* (Aarhus, Denmark: Aarhus Kommune, 2007), www.aakb.dk/files/file_attachments/29._juni_2010_-_1355/corevaluesmediaspace_web.pdf (accessed March 8, 2012).

11 City of Aarhus, *Mediaspace: Competition Brief* 1 (Aarhus, Denmark: 2007), 19. http://www.urbanmediaspace.dk/sites/default/files/pdf/konkurrencemateriale_volume_1_english.pdf (accessed March 8, 2012).

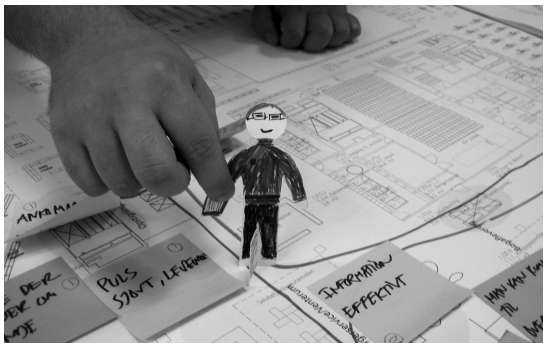


Figure 2 (left)
Photo of the Inspiration Card Workshop.

Figure 3 (right)
The Living Blueprint Workshop.

others use existing or custom-made Participatory Design techniques, some rely on new instruments or technologies to scaffold participation, and some initiatives are long-running explorations of how the library as a public institution is being or should be transformed.

A series of conventional events for involving stakeholders, including public hearings, have been held throughout the process. These events are typically open events announced in public media, which feature the presentation of a specific aspect of the project (e.g., the location of the new building or accessibility issues), followed by open discussions. We also have used established Participatory Design techniques in more focused events, such as inspiration card workshops.[12] These workshops are collaborative design events in which professional designers and participants who have knowledge of the design domain combine sources of inspiration from the library domain and interactive technologies to create design concepts. In addition to established techniques, we also have developed several new participatory techniques specifically for the Mediaspace project. For example, the "living blueprints" technique addresses the problem that arises when users and stakeholders have difficulty envisioning what the un-built future building will be like, and thus also have difficulty voicing opinions and developing concepts for it. In a living blueprint workshop, participants take on the role of a cardboard character and move themselves through the building to bring the future environment alive; manipulating characters in this way allows workshop participants to explore and comment on the un-built building (see Figure 2 and 3).

In another series of participatory events, new technological systems have been designed to inspire and facilitate citizen participation. The installation, Voices of the City, is an example of a system developed specifically to scaffold participation in the early phases of the Mediaspace project (see Figure 4 and 5).[13] This interactive exhibition provided an interactive table that allowed users to maneuver around maps representing the city of Aarhus, Denmark, or the world. On each map, users could find and hear

12 Kim Halskov and Peter Dalsgård, "Inspiration Card Workshops," in *Proceedings of DIS 2006* (New York: ACM Press, 2006), 2-11.

13 Rune Nielsen, *New Uses of Interactive Technologies in Spatial Design* (Aarhus, Denmark: Aarhus University, 2006), 81-101.

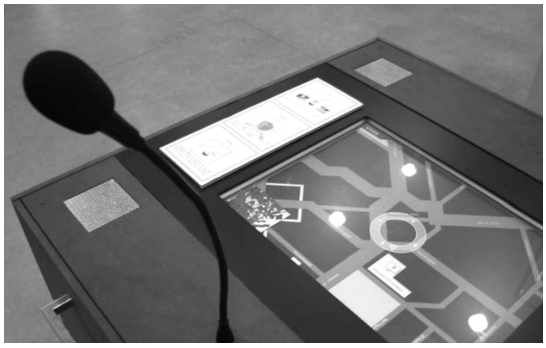


Figure 4 and 5
Photos of Voices of the City Installations.

context-specific scenarios related to the roles and capabilities of the library and the future Mediaspace. In addition, users could add comments to specific locations on the map by talking into a microphone embedded in the table. In this way, users could share their opinions or listen to what other users had to say and comment on it. Two identical installations were developed and made available at the Main Library in Aarhus and in a local arts center to gather people's opinions, and these recordings were synchronized with a dedicated website.

Finally, a number of longitudinal initiatives comprising multiple events have been carried out. For example, the Transformation Lab project initiative ran from 2004 to 2007 and was developed to explore and experiment with how the physical library space can support both present and future user needs in the library. In particular, the lab focused on how flexible physical settings, interactive elements, and ubiquitous computing could be developed and used to support knowledge dissemination and activities in the physical library. In the foyer of the current municipal library, five experimental labs were staged: the literature lab, the news lab, the music lab, the exhibition lab, and the square (see Figures 6 and 7). In each lab, different configurations of interactive technologies and physical spaces were developed and tested. The projects were located in the library foyer so that all library visitors were exposed to the experiments and invited to take part in shaping the future library. This approach yielded insights regarding the physical space and materials, the role of users and librarians, and the potential for external cooperation.

Discussion: Challenges to and Opportunities for Participation

The field of Participatory Design continuously faces new challenges and opportunities as methods from the field are brought into new contexts and digital technologies move into new domains. Given the focus of this article, recent contributions to the field, such as Oostveen and van den Besselaar and Simonsen and Hertzum are particularly salient because they examine the challenges that arise from employing Participatory Design approaches to large-scale projects.[14] Simonsen and Hertzum point out a series

14 See Anne-Marie Oostveen and P. van den Besselaar, "From Small-Scale to Large-Scale User Participation: A Case Study of Participatory Design in e-Government Systems" in *Proceedings PDC 2004* (New York: ACM Press, 2004), 173-82; and Simonsen and Hertzum, "Sustained Participatory Design: Extending the Iterative Approach," *Design Issues* 28, no. 2 (Spring 2012), 10.

Figure 6
The Transformation Lab as News Lab.

Figure 7
Music Lab.

of specific challenges identified in a large-scale effort to use Participatory Design strategies in a healthcare sector development. These challenges include obtaining appropriate conditions and focus for Participatory Design; managing a multitude of stakeholders; managing stepwise implementation processes; and conducting realistic, large-scale Participatory Design experiments.[15] These same challenges are, to some extent, present in the Mediaspace project and clearly are issues that have been and continue to be highly relevant for the project management group. For example, the challenge of managing a multitude of stakeholders is particularly pertinent. The same holds true for the challenge of orchestrating and conducting Participatory Design experiments as part of the project (e.g., the transformation lab experiments). However, the Mediaspace project differs from the earlier projects in a number of ways—most specifically by being a public project aimed at the entire city population. For this reason, I use the Mediaspace case in the following paragraphs to discuss a particular set of Participatory Design concerns related to large-scale public development projects, each of which presents designers with both challenges and opportunities.

15 Simonsen and Hertzum, "Sustained Participatory Design: Extending the Iterative Approach," 10.

Addressing Heterogeneous Stakeholders and Establishing Participation as a Relevant Activity

As suggested, the challenges in managing the multitude of stakeholders involved in or related to a project such as Mediaspace are clearly visible. These stakeholders include politicians, sponsors, various steering committee and project management team members, architects, contractors, local institutions and organizations, and perhaps most importantly, library staff and citizens, who can be considered the end-users of the project. Many early Participatory Design projects have been undertaken in workplace settings, in which most stakeholders could be immediately identified, are generally already connected in working toward some common goal, and could relate easily to a development project. Although they might not have readily conceived of how a development project might change their future practice, they were most often very familiar with their current practice. However, things are not so straightforward for the citizens who will be the future users of the library's services. Because this group potentially comprises all of the citizens of Aarhus, the target audience is highly heterogeneous. The difficulties are compounded by the fact that even though identifying different types of users and involving them are possible, their needs are likely to change in the future, perhaps even before the Mediaspace project is completed, and likewise, the library services might also be transformed in ways that are not yet known. While many domains are challenged by the emergence of new technologies, the challenge posed to libraries is especially pertinent, since technological developments in the distribution and consumption of media can severely disrupt traditional library services and functions. As the library setting changes, users whose current practices for accessing information and media keep them from using the library or participating in the project might actually *become* users, but without having helped to shape the library. On the one hand, this situation presents designers with a highly complex challenge. On the other hand, it opens up new opportunity spaces for design because it prompts designers to understand the needs and practices of these potential users and explore ways of involving them actively in the project.

One of the ways in which the Mediaspace project managers have addressed this issue is by establishing participation as a central value and articulating the seven core values as ongoing guidelines for the project. An example of how this perspective affects the process can be found in the explication of the value, the citizen as key factor: "It is important to retain a changeability that reflects the citizen's varied and changing needs. Therefore, the building must contain versatile and flexible learning environments and open spaces."[16] In this case, the awareness that users' needs are

16 Aarhus Municipality, *Mediaspace–Core Values*, 2.

heterogeneous and may change over time results in specific demands for the future building and services, the required flexibility of which is made apparent throughout the process in, for example, the architectural competition brief.

Kensing identifies three key requirements for participation in design: access to relevant information, the possibility for taking an independent position on the problems, and participation in decision-making.[17] The task of distributing relevant information about the Mediaspace project can be relatively easy for some stakeholders (e.g., librarians and frequent library visitors) but very difficult for citizens who visit the library infrequently, or who do not use the library at all. Even though the Mediaspace project is on a massive scale, has had strong coverage in local media, and has included a wide variety of citizen involvement events, only a small proportion of the population is aware of the project. Continuing to raise awareness of the project's existence means providing information about how the process is organized, who the stakeholders are, and how to influence it. The latter is particularly pertinent in relation to participation: Establishing participation as a relevant activity in which citizens should engage is not straightforward. The Mediaspace project is of such a huge scale that future users—especially casual or infrequent library users—might feel overwhelmed by it and have difficulty conceiving that they can influence the process. The citizens who are the intended future users of the library might not recognize that the process is of immediate relevance to them and thus might ignore information about how they can become involved in this process. As Mediaspace project manager Ostergard asserts, "[t]he big dilemma is that you have to know the project is there before you can influence it. And many people don't discover the existence of the project until construction of the building commences."[18]

Developing Techniques and Technologies to Scaffold Participation

One of the ways in which the Mediaspace project has addressed the concern for informing and involving citizens in the project is through elements of the project such as Voices of the City and Transformation Lab. In these projects, experimental prototyping has played an important role, presenting users with installations that inspire engagement and involvement while also exposing stakeholders and users to assemblies of technologies that might come to play important roles in the future library. For example, Voices of the City was developed specifically to inspire users of the installation to voice their opinions about the future Mediaspace and its relationship to the city, the country, and the world; at the same time, the installation was an experiment into how new forms of interaction in public places can establish dialogue between authorities and citizens, as well as between citizens.

17 Finn Kensing, "The Trade Unions' Influence on Technological Change," in *Systems Design For, With and By the Users,* U. Briefs et al. eds., (North Holland: 1983).

18 Marie Ostergard, Personal Communication, (May 5, 2010).

Related to these types of experiments are techniques such as Living Blueprint, which have been developed specifically for the purpose of scaffolding participation in the development process. The technique was intended to improve the understanding of the building and consequently the basis for participating in informed dialogue about it, thus echoing the development of participatory systems such as Voices of the City. In their work, Clement and van den Besselaar expand on Kensing's (1983) list of requirements for participation, arguing for the availability of appropriate participatory development methods and for leaving room for alternative technical and organizational arrangements.[19] A large-scale project such as Mediaspace opens up new opportunity spaces for the development of Participatory Design. Its development of new participatory methods and technologies offers stakeholders ways of experiencing and engaging with the project and yields insights into how technological and organizational arrangements of the library might shift.

Iterative Development and Institutional Transformation

Although the Mediaspace project is not a Participatory Design project in the traditional sense of the word, it reflects the epistemological standpoint of Participatory Design: Designers need insight into practice, users need insight into technological potentials, and the best way of developing this reciprocal knowledge is collaboratively through joint, practice-based experiments. An aspect of the Mediaspace project of particular interest from a Participatory Design perspective is that the development process extends beyond the development of a system or building because it also concerns the development and potential transformation of the institution through the project. Serving not just as an iterative process model, Participatory Design also shows how iterative development in large-scale projects goes hand in hand with institutional transformation. Bødker and Iversen clarify that Participatory Design aims not just to design technological systems, but also to "design conditions for the whole use activity."[20] In the case of Mediaspace, this aim extends into the overarching question of how digital technologies will influence the role and services of the library in society. This question is one that designers, and in this case also the Mediaspace project managers, must embrace. According to Bødker and Iversen, designers must:

> confront use with new ideas, as design is not a step-wise derivation of the new from the existing, neither is the new coming unexpectedly. Design is not a process heading toward a predetermined goal, but a process of which the vision is shaped in continuous interaction with the use practices that it originates from, as well as with other uses, other technologies serving as guiding lights.[21]

19 Andrew Clement and Peter van den Besselaar, "A Retrospective Look at Participatory Design Projects," 29-37.

20 Susanne Bødker and Ole Iversen, "Staging a Professional Participatory Design Practice: Moving PD Beyond the Initial Fascination of User Involvement," in *Proceedings of NordiCHI '02* (New York: ACM Press, 2002): 12.

21 Ibid.

This perspective speaks to the responsibility of designers and project managers in large-scale public development projects to address how ongoing changes in the society affect the project, and to explore the influence of these changes through participatory initiatives.

One of the challenges that accompanies such a participatory approach is that of synthesizing multiple streams of knowledge that inform the development process. The long list of participatory initiatives in Mediaspace implies an extensive series of inputs from a wide variety of stakeholders. No formulaic checklists drive how this information can productively be analyzed to inform the future process, but designers and project managers nevertheless are responsible for making sure it does so. In the Mediaspace project, the information from participatory initiatives and involvement of the public has been incorporated into the ongoing process in several ways. In longitudinal events, such as Transformation Lab, insights from one of the first lab experiments were incorporated into the planning of later lab experiments. The findings from ongoing experiments have been documented in reports made publicly available (e.g., in the vision process and Transformation Lab).[22] Findings also have often been presented in easily accessed formats and distributed via social media. For example, the Transformation Lab project group has a dedicated Youtube channel, which documents experiments and prototypes (http://www.youtube.com/user/transformationlab); the library has a Flickr stream that is continuously updated with photos from events (http://www.flickr.com/photos/aakb/); and the entire Mediaspace project is documented on a dedicated website (http://www.urbanmediaspace.dk/en), which is continuously updated as the project progresses.

Insights and findings from the participatory events have been incorporated into the ongoing process in manifest ways, including in the visions that contractors have to address in their bids. However, the most important, yet least tangible, way in which this information has informed the process is through the ongoing debates it has spurred among members of the Mediaspace project groups and the steering committee. The challenge of keeping the organization open to input and inspiration from citizens will remain, even after the completion of the Mediaspace building as the institution continues to evolve along with society.

Regarding the future Mediaspace, the vision for the institution is that it will support and be open to ongoing development by both users and the institution: "Mediaspace should be a flexible and dynamic sanctuary for everyone in search of knowledge, inspiration, and personal development—an open and accessible learning environment supporting democracy and unity."[23] Exploring whether and how these ideals can be realized in practice will be a compelling area of study.

22 Søren Holm, Mediaspace–Core Values (Aarhus, Denmark: Aarhus Kommune, 2007), available online at http://www.aakb.dk/files/file_attachments/29._juni_2010_-_1355/corevaluesmediaspace_web.pdf (accessed March 8, 2012); and Aarhus Public Libraries, *Transformation Lab–A Report on Forms of Dissemination in the Physical Space* (Aarhus, Denmark: Aarhus Public Libraries, 2007).

23 Rolf Hapel and Marie Ostergard, *Mediaspace: Knowledge, Pulse, and roots* (Aarhus, Denmark: Municipality of Aarhus, 2007), 3.

Conclusion

This article has examined the role of values and strategies of Participatory Design in large-scale public projects, and in particular the challenges and opportunities related to participation that arise in such projects. The three concerns discussed here—addressing heterogeneous stakeholders and establishing participation as a relevant activity, developing techniques and technologies to scaffold participation, and iterative development and institutional transformation—do not represent an exhaustive list of the topic; rather, they are the most salient concerns that stem from approaching the Mediaspace project from a Participatory Design perspective. The underlying premise of this examination has been that Participatory Design is more than a set of techniques; it instead encompasses a set of ideals and values that extend beyond the individual techniques used. In the same line of thinking, the library can be construed as a socio-cultural institution that serves as more than a repository of physical media; more broadly, it is a bearer of culture and an arena for participation and democracy. These ideals are particularly salient in relation to the Mediaspace project because it is a project paid for by citizens and sanctioned by elected politicians that strives toward empowering citizens and strengthening democracy. In many respects, the Mediaspace case therefore represents a rare attempt to place participation at the center of a large-scale public project and to use Participatory Design techniques to inform the project.

Approaching Mediaspace from a Participatory Design perspective has provided insights into the challenges and opportunities for designers and project managers, offering to it knowledge from the field about how specific participatory techniques work, and showing how values inherent in Participatory Design can inspire efforts in this type of domain. In return, the study of Mediaspace can contribute to the further development of Participatory Design in large-scale public projects. The study presented here has resulted in a relatively well-developed understanding of central challenges and opportunities in this domain; nevertheless, the solutions to these challenges and the ways in which these opportunities might be seized are less obvious. Addressing these issues is an ongoing task, and seeing the results of this work in the future is of great interest—both in terms of the continuous development of Mediaspace and in related projects—to those who pursue Participatory Design.

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Toward a Public Rhetoric Through Participatory Design: Critical Engagements and Creative Expression in the Neighborhood Networks Project

Carl DiSalvo, Marti Louw, David Holstius, Illah Nourbakhsh, Ayça Akin

Introduction

In her paper, "P for Political," Beck poses the question: "What constitutes political action through computing?"[1] Certainly, the history and range of contemporary projects in Participatory Design provide a rich and varied set of answers to that question. To those answers, we would like to propose two others: prompting critical engagements with technology and enabling people to use technology to produce creative expressions about issues of concern.

By *critical engagements* we mean experiences that bring about the reflective analysis and interpretation of issues, building from traditions in education and in the arts and design.[2] In particular, we are interested in facilitating encounters that reveal and/or call into question common assumptions and beliefs about both technology and the urban environment, and the possible relations between these subjects. The goal of these critical engagements is to provide people with experiential knowledge so that they can make informed and insightful suppositions and judgments concerning the capabilities, limitations, and applications of technology.

By *creative expressions of issues* we mean imaginative and resourceful representations of problems, or possible interventions into the conditions of a problem, which have convincing and aesthetic qualities. Regarding the use of technology, our interest is in how people apply and manipulate the capabilities of a given technology while infusing the artifacts or systems they produce with their own voice and style. Our goal is not to teach people to be technologists per se, but to help bring people to a point of technological fluency where they are comfortable with and capable of using technology beyond familiar uses.

Taken together, critical engagements with technology and the creative expression of issues through technology begin to form a public rhetoric: They constitute the activity of discovering,

1 Eevi Beck, "P for Political: Participation Not Enough," *Scandinavian Journal of Information Systems* 14, no. 1 (2002): 77-92.

2 In the arts and design, see Anthony. Dunne and Fiona. Raby, *Design Noir: The Secret Life of Electronic Objects* (Basel: Birkhäuser, 2001); Grant Kester, ed., *Art, Activism, and Oppositionality* (Durham, NC: Duke University Press, 1998); Leah Lievrouw, "Oppositional and Activist New Media: Remediation, Reconfiguration, Participation," in *Proceedings of the 2006 ACM Conference on Participatory Design: Expanding Boundaries in Design* (New York: ACM Press, 2006): 115-24; Nato Thompson and Gregory Sholette, eds., *The Interventionists* (Cambridge: MIT Press, 2006); and Material Beliefs, http://www.materialbeliefs.com (accessed August 1, 2009).

inventing, and delivering arguments about how we could or should live in the world.[3] The artifacts or systems conceived or created become rhetorical by their persuasive intentions and capabilities, and by the way they inform and/or provoke a response from or dialogue with others.

This notion of a public rhetoric has salience to design, which itself can be portrayed as a form of argument.[4] Positioning design as rhetoric does not claim some essential or deterministic quality of technological artifacts or systems. Nor does it suggest that design is fundamentally duplicitous, as contemporary pejorative notions of rhetoric might imply. Rather, positioning design as rhetoric calls attention to the ways in which the built environment reflects and tries to influence values and behavior and explicitly recognizes the capacity of people to design artifacts or systems that promote or thwart certain perspectives and agendas. In this light, design—inclusive of both the process of making artifacts and the artifacts made—can be considered a discursive activity, and Participatory Design can be cast as using design to enable people to take part in public discourse in new or more effective ways. This participation becomes a kind of political action through computing as people use technology to gather data, communicate, and solicit support for their perspectives, with the hope of initiating change.

We developed the Neighborhood Networks project to facilitate and investigate this particular kind of political action through computing. The project includes the production and evaluation of multiple public participatory design workshops that provide opportunities for neighborhood residents to engage in the open exploration and application of emerging technologies in the context of neighborhood activism. In the Neighborhood Networks project, we are particularly interested in the use of robotics technology in urban community contexts. In this paper, we describe the structure and activities of one of the Neighborhood Networks programs and discuss the experiences and outcomes of the workshops as evidenced through conversations among participants and the artifacts designed. In the discussion, we call attention to the ways in which the Participatory Design process fostered critical engagements with technology and enabled residents to creatively express local concerns and suggest possible technological interventions to the conditions of those concerns.

Project Description

Neighborhood Networks was a community-based Participatory Design research project that ran from 2007 through 2010. The project consisted of multiple community workshops in selected neighborhoods in Pittsburgh, PA. In this paper, we report on the first community workshop, which took place in the Lawrenceville neighborhood of Pittsburgh. In the Lawrenceville workshop, seven meetings were held over an eight-week period. Meetings occurred

3 See Richard Buchanan, "Design and the New Rhetoric: Productive Arts in the Philosophy of Culture," *Philosophy and Rhetoric* 34, no. 3 (2001): 83-206.

4 Ian Bogost, *Persuasive Games* (Cambridge: MIT Press, 2007) and Richard Buchanan, "Design and the New Rhetoric: Productive Arts in the Philosophy of Culture," *Philosophy and Rhetoric* 34, no. 3 (2001): 83-206.

in the evenings, once a week, for two hours. The meetings were held at a multi-use community center, which was chosen because of its standing in the community as a place for people to gather and host neighborhood activities. Neighborhood residents were informed of the workshops through flyers posted around the neighborhood and in the center, notices in a neighborhood print bulletin, the email lists of community organizations, and word-of-mouth. The summer program began two weeks after these postings, with approximately 20 residents participating in the first evening's activities. Of the initial 20 participants, 14 continued through to the final workshop. Participants varied in age and gender, including four middle-school-aged children (3 boys, 1 girl), eight adults aged 35 to 55 (5 women, 3 men), and two adults over 55 (1 woman, 1 man). The participants were all residents of the neighborhood. None of them claimed to have technical expertise, and four characterized themselves as artists or artistic. The workshop was separated into four distinct phases.[5] The activities of each phase were developed to build toward our project goals, leading the participants through reflective inquiry into the limitations, capabilities, and potential uses of sensing and robotic technologies in their neighborhood, with the intention of enabling them to discover and invent novel and compelling applications of these technologies for locally relevant issues.

Throughout the workshops, we took an active part as design researchers in enabling the use of the technologies and structuring the concept development and prototyping activities. Specifically, our own design activities were focused on constructing the means by which the participants could discover and express connections between the capabilities of a given set of technologies and issues that were salient to them. Our primary role, then, was not as designers of goods or services in the familiar sense, but as facilitators and educators. In the end, the concepts and prototypes were developed and produced by the participants with our assistance and feedback, but they were ultimately outcomes of the participants' own desires, imaginations, and skills.

Phase 1: Initial Engagements

The first phase of the workshop was designed to familiarize participants with the basic capabilities and limitations of sensing and robotics technology and to ground the use of these technologies within their neighborhood. Because of the novel character of the technologies and the desire to provide a solid foundation for their future design work, we chose to move through Phase 1 in the first two meetings.

Scavenger Hunt with Commercial Sensors

Our initial objective was to provide participants with a broad introduction to the concept and activity of technologically mediated

5 Because of space limitations, the description of the program has been significantly abridged. A more in-depth description of the program's activities is available in Carl DiSalvo, David Holstius, Illah Nourbakhsh, Ayça Akin, and Marti Louw, "The Neighborhood Networks Project: A Case Study of Critical Engagements and Creative Expression Through Participatory Design," in *Proceedings of the 2008 ACM Conference on Participatory Design Conference* (New York: ACM Press, 2008): 41-50, and in Carl DiSalvo, Marti Louw, Julina Coupland, and Mary Annq Steiner, "Local Issues, Local Uses: Tools for Robotics and Sensing in Community Contexts," in *Proceedings of the 2009 ACM Conference on Creativity and Cognition* (New York: ACM Press, 2009): 245-54.

Figure 1
Participant engaging in sensor scavenger hunt.

environmental sensing, using professional sound-level and air-quality sensor platforms. We began the first session with a sensor scavenger hunt—an activity designed to excite participants and to encourage exploration of both the technology and the neighborhood (see Figure 1). As an activity, the sensor scavenger hunt builds on prior work in participatory design that investigates the use of playful approaches and games to motivate participation, stimulate creative and critical thinking, and overcome hesitancy to using unfamiliar technology.[6]

The sensor scavenger hunt participants, divided into small groups ranging from three to seven people, were given a packet of materials, including an environmental sensor (measuring either CO/CO2 or sound levels), a map of the area, a Polaroid camera, a pack of film, a pen, and a printed slip of paper outlining the tasks of the scavenger hunt. The scavenger-hunt tasks were developed around the idea of "taking a reading." For example, three of the tasks were: "Find a place with the highest value for a given sensor," "Go someplace you have never gone before and take a sensor reading," and "Find the least agreeable place and take a sensor reading." After taking a sensor reading, participants would take a Polaroid photograph of the place and then write the sensor readings and a brief description on the photo. Participants also marked the location of the sensor reading on the map provided.

After about one and a half hours, participants returned to the community center to share their experiences and documentation. This activity took place around two large maps of the area (30 by 40 inches, or about 1 square meter). As participants taped each Polaroid onto the maps, they described the place, the readings taken, their reasons for choosing that particular place, and their understanding of the readings.

Exploring the Neighborhood with the Canary

In the second session, participants were introduced to the Canary—a relatively inexpensive, handheld sensing and robotics platform that we designed and built for use in the Neighborhood Networks workshops. The objective of this session was to familiarize participants with the specific features of the Canary and to probe the possible application of sensing and robotic technologies in the neighborhood. Compared to desktop computers or mobile devices, only a few robotics prototyping tools are simple and robust enough to support Participatory Design in a community setting. The Canary is an attempt to expand the range of technologies available to Participatory Design endeavors, specifically to include robotics by combining adequate sensing capabilities with basic kinetic actuation in an accessible form factor. The Canary design allows participants to easily open and examine the internal components, touch actual sensors, and experiment with them

6 See Eva Brandt and Jorn Messeter, "Facilitating Collaboration Through Design Games," in *Proceedings of the 2004 ACM Conference on Participatory Design* (New York: ACM Press, 2004): 121-31, and Eva Brandt, "Designing Exploratory Design Games: A Framework for Participation in Participatory Design?" in *Proceedings of the 2004 ACM Conference on Participatory Design*, 57-66.

directly. The six mounted sensors visible on the main circuit board are air quality, light, sound, humidity, pressure, and temperature. Readings from these sensors are continually displayed on an external, built-in, LCD screen, which also tracks sensor highs and lows. The Canary comes with four servomotor ports for connecting motors to the Canary, thereby enabling prototype devices to be animated immediately, based on sensor readings.

For the next session, participants were given a 10-minute hands-on overview of the Canary and then asked to use it to explore conditions both inside the community center and in its immediate surroundings for 30 minutes. After the participants returned, we discussed their experiences, encouraging them to reflect on the differences and similarities between the Canary and the professional sensors used the week before.

From Exploration to Expression

The uniqueness of the Canary stems from the way it combines servomotor outputs with environmental sensors and signal processing in a single package. The Canary, as well as the artifacts constructed using the Canary, can be considered robotic because it enables the production of physically embodied entities that respond to the environment. Moreover, the manner in which the Canary "expresses" environmental stimuli is user-configurable. Users can select one of several different sets of "expressions," resulting in a different mapping of sensor inputs to motor outputs. These motors automatically move in response to environmental stimuli, facilitating the prototyping of reactive devices without any programming or engineering knowledge.

To demonstrate these capabilities, we developed a simple, single-axis, single–motor-driven mechanism that simulated a large pair of butterfly wings. By connecting the wing mechanism to different servo ports, we could animate a variety of stimuli (e.g., clapping near the microphone, or breathing on the humidity sensor). After demonstrating the actuation capabilities of the Canary, we encouraged participants to spend the final 30 minutes of the session experimenting with craft materials (e.g., feathers, pipe cleaners, and cardboard) to produce objects or sculptures of their own design that used the Canary to produce movement in response to sensed data.

Phase 2: Concept Development and Design

The second phase of the workshop concentrated on the discovery and invention of possible uses of robotic technology (via the Canary) in the context of the Lawrenceville neighborhood and its issues. The objectives of this next session were twofold: to enable participants to imagine what might be possible using the Canary

and to facilitate the documentation and specification of their designs, with at least enough definition to enable them to begin prototyping the following week. To achieve these objectives, we developed a robot storyboarding activity.

Robot Storyboarding

Through the process of storyboarding, participants tried to make their ideas more concrete and explicit by producing sketches and written descriptions of their robot, in terms of its construction, purpose, and actions/reactions over time. A key quality of storyboards is that they do the work of both eliciting and documenting. We provided a customized robot storyboarding sheet, with plenty of space for both drawing and writing, and included prompting questions organized around four themes:

- Actions: What actions will people, things, or the environment do that affect the robot?
- Sensing: What does your robot sense from those actions? Using what sensors?
- Output: How does your robot react to those actions and express what it senses?
- Communication: What do you want to communicate through your robot? How should people feel or respond to your robot?

Getting participants to make use of the storyboards required more explanation and encouragement than we had anticipated. More than half expressed strong resistance to drawing complete designs. However, nearly all participants (with one exception) at least roughly sketched some set of basic mechanisms or sensors they intended to use. As a method of design and documentation, writing was more actively pursued than drawing. All participants wrote at least a few (two or more) sentences in response to each of the questions.

Phase 3: Iterative Design and Production

Phase 3 spanned three meetings and focused on the iterative design and production of the final prototype for presentation. During this time, the workshop sessions took on an "open-studio" format, in which participants would arrive at the community center and work on developing their prototype. This work took a diversity of forms, with some participants forming small groups of two or three and others working individually. In addition to building the prototype robots, all participants were given posterboards and instructed to document their robot design process, and to provide an overview of the purpose and functioning of their robot for the final presentation.

During this time, we—as researchers—took an active role in scaffolding the work of the participants. We casually walked around the room, stopping at tables and asking participants to describe what they were doing, or asking if they wanted any feedback or direct assistance. Participants were at first hesitant to ask for either. However, as time passed, and as participants ran into mechanical or conceptual difficulties, they began to call on us for technical assistance and to seek feedback to help them achieve their goals for their project.

Phase 4: Final Presentation

The final session was organized as a public event, modeled loosely after a science fair, at which participants presented their designs to the community and invited stakeholders to come and offer feedback. On the evening of the event, participants arrived early to set up their project displays, which included both the robot prototypes and their documentation posters. Each participant, or group of collaborating participants, was given a table to use, and the tables were arranged around the perimeter of the room.

The use of the poster boards proved to be important, because three of the teams were unable to finish their prototypes to a level of completeness with which they were satisfied. The posterboards were used by these groups as an effective means to extend and complete the communication of their ideas via another format. For the visitors, the posterboards served to distinguish people and projects by establishing spatial distinctions and also created a visual order to the room layout.

The public event was well attended. As attendees arrived, they milled about, walking among the displays and chatting with the participants, who presented their projects and discussed their process and motivations. In addition to the 12 participants, another 25 people or so from the community attended, including family members, neighbors, two representatives from two different community organizations, and a city planner from the City of Pittsburgh Department of City Planning. Participants said they enjoyed the opportunity to share with their neighbors, but they were most excited by the presence of, and the opportunity to interact with, the city planner and the representatives from community organizations.

Evidence of Critical Engagements and Compelling Expressions

As stated, the goal of the Neighborhood Networks project is to prompt critical engagement with technology and to enable people to use technology to produce creative expressions of issues of concern. Evidence of such engagements and expressions were found

in the conversations that emerged throughout the workshops and in the artifacts participants created. In the following paragraphs, we describe and analyze these conversations and artifacts, with an eye toward articulating how they came to form a kind of public rhetoric. Because the amount and range of discussions within the workshop were extensive and broad, we have focused our description and analysis on two activities and a single prototype.

Scavenger Hunt Activity: Shared Experiences of Productive Questioning

The scavenger hunt activity in particular prompted a rich set of critical engagements between the technology, the neighborhood, and the participants who found the experiences both exciting and challenging. They were excited by the way they had to collaborate to understand and make use of an unfamiliar technology that they perceived as usually being for "experts," and were challenged because the sensors were at times ambiguous in their readings or even contradicted the participants' expectations. Through these experiences, the participants engaged in reflective analysis and interpretation of the sensing technology and its relation to their local environment.

For example, many groups used the air quality sensor to explore obvious sites of pollution, combustion, or natural rot, such as sewers, portable toilets, commercial waste bins, tail pipes, and exhaust vents. However, most of these sites did not emit stimuli detectable by the given sensors, resulting in readings that did not differ from casual readings noted on the street. In particular, the readings for volatile organic compounds (VOCs) or CO taken in a garden did not differ much from those taken next to an industrial waste bin. In other cases, the differences in sensor readings were counter to what participants expected. For example, through their sensing, participants discovered that the readings of VOCs can be higher in a playground next to a tire swing than near a sewer (as the rubber tire swing off-gasses chemicals, but no gasses were at that moment coming through the sewer). In undertaking these sensing activities, participants immediately perceived and noted such differences between presumed and measured air quality and would "talk through" both the way the sensors were functioning and the environmental factors.

The ways in which participants collaborated in the use of the sensors were also significant in shaping their processes of analyzing and interpreting the sensor technology. As they took sensor readings, and particularly if the readings were confusing or surprising, participants would ask each other questions, such as

whether they needed to adjust the sensor and, if so, how to do so. During outings, participants would stand shoulder-to-shoulder, often with multiple people holding the sensor platform, and vie to examine the readings. The photo documentation was also undertaken collaboratively. Across multiple groups we witnessed a process in which one or two people would hold the sensor platform, while another person posed next to the location being sensed, often pointing at it, while the remaining participants would stand back and together frame and take the picture. In this way, the act of taking a sensor measurement was transformed from a solitary action into a collaborative group activity. In addition to operating the sensor platforms in a collaborative way, we observed participants frequently discussing, debating, and negotiating where to go and what to measure once there. Identifying the most agreeable or disagreeable place was not an opinion-neutral task, and the assignment resulted in group conversations about what was agreeable or disagreeable and also what was sense-able and not sense-able.

By the end of Phase 2, participants felt capable of using the technology and were enticed by its potential applications. They also were able to begin to question—in an experientially informed manner—the accuracy and appropriateness of sensing in the urban environment. While participants appeared to enjoy the social activity of sensing, they were also initially suspect of the sensing technology because of the ambiguity in sensor readings and the mismatch between perceptions of a place and its measurable qualities. The things observed, encountered, and experienced through the scavenger hunt would later spark conversations concerning neighborhood issues and the potential applications of technology to address those issues.

The Robot Camera Prototype: Engaging the City Through Dialogue and Concepts

Traffic emerged as a paramount issue in the summer workshops. Nearly three-quarters of participants' concepts in some way tried to address problems related to speeding and loud traffic on neighborhood streets. As a salient example of how participants produced imaginative and resourceful interventions for the problem of traffic, one participant named Mary conceived of and designed a device simply called *The Robot Camera*, which would monitor the sound levels of passing cars, and when a certain sound level was exceeded, a robotic finger mechanism would take a photograph using a digital camera. The photograph would then be "sent to the city" to report on the car. In addition to visually recording the noise incident with a photograph, it was also suggested that an audio recording could be made that would document the actual sound and level.

The Robot Camera generated significant discussion among participants. Through the storyboards, discussion, and prototyping, participants materially and dialogically surfaced and traced multiple themes regarding technology and the city, including legal issues, questions concerning technical feasibility, and questions of efficacy. The following discussion is striking because it so clearly illustrates the ways that Participatory Design activities can generate sophisticated reflections on the relations between technology and the urban environment.

Upon first presentation of the *Robot Camera* idea, numerous participants stated there might be "issues" with such a device, particularly surrounding the legality of capturing pictures of people purportedly breaking the law. But in the course of the conversation, several participants noted an existing surveillance system in the city that captures people running red lights, and they offered this system as a point of comparison, rallying to the existing technology/system as a defense of the proposed system. This discussion prompted further discussion of "the city" as a specific entity, evidently distinct from the individual or groups in the neighborhood in terms of what it legally and technically is capable of doing, exemplified in the following exchange between two participants:

> A: *Well the city does it*. [referring to municipal traffic monitoring cameras]
>
> B: *But that's the city and they can do things like that. It's different than just us doing it, and I bet even for them it's tough*.
>
> A: *Well they* [the drivers] *are breaking the law. And if people are speeding, gunning their engines and all that, or breaking windows or writing all over* [referring to spray painting], *they are breaking the law, too.*
>
> B: *Yeah, but I still don't know if we can take their picture and then send it around like that to the police or whoever or projecting it on the street*.

Participants also discussed the technical feasibility of the *Robot Camera*. These discussions illustrate the developing understanding of the capabilities and limitation of the technology and the capacity for invention and resourcefulness in its application. The first set of feasibility questions concerned the Canary itself and ways to add additional functionality to the limited capabilities of the Canary. Mary was concerned that the microphone might not be capable of distinguishing moderate, but nonetheless annoying, sounds. As another issue, participants wondered if the Canary could record the time of the incident. After learning that the Canary did not and could not record time, a participant proposed an alternative: You could have two synchronized cameras—one that took a picture of the event, and the other a picture of a clock.

The issue of how to communicate this information to the city was also raised. Mary realized it might be difficult to automatically email this picture to the appropriate person at the city. She and others assumed such a thing might be possible, but they were unsure of how to do it. As Mary noted, "The Canary connects to the computer, and if the camera is also connected to the computer and the computer is on the Internet, you should be able to do it." As the discussion continued, a suggestion was made that perhaps the photograph could be sent in separately, either as a digital photograph or even as a Polaroid sent through the mail system. When asked if she would be able and willing to mail the photograph, she said, "Yes, I could do something like that; I could totally do something like that. It could do the sensing and the recording, and I could send it on to the city."

The design of the *Robot Camera* thus sketches the ways in which participants began to bring critical engagements to bear on the production of creative expressions. The design process prompted participants to examine together their concerns with the capabilities of the given technology and, in the case of the *Robot Camera*, to conceive of an intervention that united these concerns and capabilities. Through this endeavor, questions surfaced that caused them to reexamine their understanding of the technology and to imagine how the technology might operate within the realm of their neighborhood. In a sense, through the design process, they were able to experiment with the invention and discovery of arguments for the local and specific uses of a given technology, having each other as an initial audience for these arguments.

Final Presentation: The Public Communication of Local Issues and Desires

Through the final presentation event, participants were able to communicate their perspectives to others in a manner intended to convince, inform, and/or provoke responses. The event provided a forum whereby the process and artifacts of critical engagement and creative expression came together to constitute a kind of public rhetoric. During the prior weeks, the participants had been the audience for each other; but at the final event, the audience for their arguments about issues in the neighborhood expanded to include other residents, as well as members of neighborhood organizations and a city planner. During the evening's busiest time, more than 30 people were in attendance—not just simply viewing the work of the participants but engaging them in significant conversations. These conversations focused on the technology; the

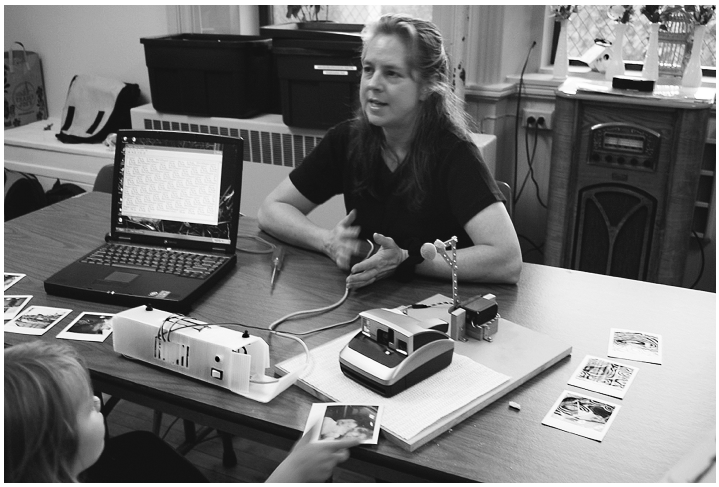

Figure 2
Participant presents Robot Camera prototype.

sensed data and its interpretation; the process of making the prototypes; and most of all, they were conversations around the ideas and motivations behind the prototypes—about the lived experience of the Lawrenceville neighbors, concerns in the neighborhood, desires for change, and possibilities for intervention. In the process of demonstrating their prototypes, participants communicated why they created what they had. From our observations of the conversations, these explanations, more than the details of the prototypes themselves, garnered the most follow-up questions from the city planner and community leaders (e.g., "Why would you want to do that?" or "Why would you only want to run this at night?"). These questions and the responses from the participants formed a casual dialogue in which the issues and desires of the participants were elucidated.

The ideas of the participants were not expressed through the prototypes alone; the robotic objects in isolation did not constitute the argument, but rather worked as part of an argument embodied and expressed through multiple materials. Many of the prototypes were only partially functional. This incompletion was actually a benefit because it challenged participants to develop multiple ways of expressing their intentions. In doing so, most of the participants had constructed stories to communicate their ideas and used the posterboards or forms of documentation as support for these stories (see Figure 2). In many ways, these stories functioned similarly to scenarios common to a user-centered design process and were grounded in the authentic experience of participants, calling attention to and leveraging the lived social and material particularities of the neighborhood. Thus, the robot prototypes, support documentation, data, storytelling, and conversation operated *together* as a rhetorical structure and format.

Conclusion

Historically, one of the objectives of Participatory Design has been to enable people to take part in the design and development of technological artifacts and systems. However, as Beck and others have stated, participation as we have commonly thought of it is "not enough:" We must consider how we can extend the participatory design project to new political forms and objectives. The explicit goal of the Neighborhood Networks project was to facilitate and examine the use of Participatory Design as a means to produce such critical engagements with technology and to give people the opportunity to use technology to produce creative expressions of issues of concern—as a kind of political action through computing. Throughout the workshops, as evidenced in conversations, activities, and artifacts, participants developed informed analyses and interpretations of sensing technologies and created imaginative and resourceful interventions to address local concerns.

In addition, the Neighborhood Networks project begins to describe a kind of Participatory Design practice that builds on the rhetorical character of design to constitute a public rhetoric. In the context of a public rhetoric, the aim of Participatory Design, then, is to enable participants to increase their visibility and the volume of their voices and to capture the imagination and attention of others in support of their agendas. In the case of the projects discussed in this paper, the arguments created were made up of prototype robots, documentation, and the narratives that participants constructed to convey the idea of their robot: how it would "work" and "fit" within the neighborhood.

Framing Participatory Design as an endeavor concerned with enabling the discovery, invention, and delivery of arguments has consequences for considering how we, as university researchers, might enable and promote these endeavors. It requires ongoing investigation into how technology functions in the construction and delivery of arguments, as a tool for discovery, and as a rhetorical device that supports certain kinds of argumentation and possesses certain persuasive qualities.[7] These qualities not only are a characteristic of the materiality of the technology (i.e., its affordances), but also are reflective of the standing of science and technology in contemporary culture. The authority of scientific data and access to the technological tools required to collect and produce that data typically reside with scientists and trained or licensed professionals. The interpretation of this data remains in these same hands and is released to the public through scientific publication, policy reports, press releases, and the media. Putting sensor technology and the data gathered into the hands of citizens to form and bolster public arguments that draw on the gathered

7 See, e.g., Ian Bogost, *Persuasive Games* (Cambridge: MIT Press, 2007).

"evidence" is a novel direction for political computing—especially when those arguments take on situated, embodied representational forms of data to creatively comment on, protest, and suggest possible interventions for local conditions of concern.

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Community-Driven Development: Approaching Participatory Design in the Online World

Jan Hess, Volkmar Pipek

Introduction

Along various lines, design has always dealt with user participation as one of the possible ways to reach a design goal. When Dorst revisited Simon's perspectives on ill-structured problems and design,[1] he suggested the notion of a "design paradoxon" as a design goal statement that potentially contains conflicting subgoals (belonging to different "discourses," along a Foucaultian notion) as the core concept of design; he described design itself as the "resolution of paradoxes between discourses in a design situation." Swann pointed out the relations between design and action research with its strong consideration of user activities and encouraged designers and action researchers to learn from each other's practices.[2]

Participatory Design methods already have followed these lines since the 1980s. However, it has always been far from obvious what participation exactly means when it comes to information technology design. In the early days of "personal computing," the lines of conflict at the workplace (i.e., employers' interest in efficiency/rationalization vs. employees' interest in good working conditions/ergonomics) provided some orientation concerning different levels of participation and how certain types of processes or user–developer interaction arenas (i.e., Participatory Design methods) influence them.[3] Today, arenas of IT design look different. IT has conquered more and more areas of our everyday life, and it is hidden in more and more devices and technological infrastructures. General computer literacy has increased among IT users, and the Internet as well as the open source movement offer new ways of articulation related to the usage and the development (e.g., support forums and user wish lists). These articulations also might have become more qualified regarding the potentials and limitations of IT. New technologies, products, or uses encounter an existing base of technologies and uses they have to match, and they often face competing socio-technical arrangements. IT development strategies adapted to these market dynamics by becoming

1 Kees Dorst, "Design Problems and Design Paradoxes," *Design Issues* 22, no. 3 (2006): 5.

2 Cal Swann, "Action Research and the Practice of Design," *Design Issues* 18, no. 2 (2002): 61.

3 Gro Bjerknes and Tone Bratteteig, "User Participation and Democracy: A Discussion of Scandinavian Research on System Development," *Scandinavian Journal of Information Systems* 7, no. 1 (1995): 73–98.

user-oriented, maybe even *user-centered*, but not necessarily *participatory*. The user was given a voice in these design processes, but to what extent the feedback is considered is not clear.

Taking these developments into account, Participatory Design researchers are faced with new challenges and opportunities. The two stereotypes of the *user-unaware developer* and the *computer-illiterate user* are replaced by more gradual mixtures of competencies. When suggesting Participatory Design arenas, we have to consider these various mixtures, as well as the ongoing learning processes that accompany a design interaction. While home and leisure settings complement traditional work environments as domains for Participatory Design, different degrees of motivation for, involvement in, and dedication to the Participatory Design interaction have to be considered. Design-time and use-time cannot be separated anymore because IT artifacts have become more flexible and adaptable, and they mutually influence each other's use and, indirectly, each other's further development (e.g., through debates on feasible technology potentials). As a result, it may always be *design-time* for dissatisfied users or users who choose a different socio-technical arrangement (i.e., a different product). As suggested by Pipek and Syrjänen,[4] Participatory Design research might react to this development by focusing on developing infrastructures-in-use rather than on developing IT artifacts.

The framing conditions for technology development offer new potentials for Participatory Design research, as well. The IT infrastructures we have today provide more ways to articulate and exchange needs, ideas, and opinions and offer participation opportunities beyond traditional views of technology design (e.g., with regard to political issues like standardization). Practical experiences and the competition with the open source movement might encourage more and more professional IT developers to take the step from "user-centered" to "Participatory" Design, giving the Participatory Design research more practical relevance and resulting in more opportunities for practice-oriented research.

In this paper, we explore an approach to Participatory Design in practice that demonstrates many aspects of the developments mentioned. A software manufacturer (Omega) for home entertainment software wanted to develop new media center software with the help of an existing online community. For about 18 months, we observed and supported the practice of developer–user relations and the initiative to redesign the product. Focusing on community-driven software development, we conceptualized and gradually improved a Participatory Design arena in order to explore the dynamics of the perceived and actual values of participation, as well as the associated expectations and fears of the

4 Volkmar Pipek and Anna-Liisa Syrjänen, "Infrastructuring as Capturing In-Situ Design," 7th Mediterranean Conference on Information Systems (Venice, Italy: Association of Information Systems, 2006). Proceedings, eds. G. Jacucci et al. I, (2006): 134-46.

participating stakeholders. Our experiences can thus inform other Participatory Design approaches that operate with virtual user communities.

We now briefly address related work that focuses on in-use Participatory Design concepts and community-driven concepts. We then describe our case setting and concept in more detail. We summarize significant effects in which we were able to observe and discuss the course that the Participatory Design interaction took, relating our findings to other Participatory Design approaches to delineate different understandings and practices of participation.

Participation in Use

Several studies on Participatory Design research already account for different modes and levels of participation,[5] but they merely reflect the historical context of participation in workplace design. One can find the normative, emancipatory direction (i.e., users should be an active part in the design of their workplace), as well as the pragmatic, production-oriented description (users have to be integrated into existing design practices, for example, by using ethnographic methods),[6] but in most approaches the design process (and the user participation) precedes the actual use of the product. Traditional design methods are focused on the professional designer with his or her (re-)design competencies: "Although design methods in IS have improved with regard to the 'technology fit' with users' needs, they are still inherently based on a perspective which focuses on the designers to be the main actor in developing IT infrastructures."[7] Bødker et al. underline the importance of user involvement in the design process.[8] They define participation in the context of Participatory Design as mutual learning processes between designers and users. Instead of involving users only as informants, genuine participation requires a continuous user involvement to obtain a shared understanding of the problems and needs.

Based on Henderson and Kyng's idea of "Continuing Design in Use,"[9] a second approach to user involvement evolved that postpones design activities into the use phase of an IT product. Ehn distinguishes the two approaches as "design for use before use" and "design for design after design" and discusses strategies for professional designers in order to participate in both arenas.[10] Similarly, Pipek and Wulf, Stevens et al., and Fischer and Scharff distinguish the "when" of design between "design-time" and "use-time."[11] In their approaches of "infrastructuring" and "meta-design," they point out that problems in the subsequent use cannot be completely anticipated while designing a product. Users will discover mismatches when they actually use the product. As a Participatory Design-centered approach, Hertzum and Simonsen reference an "Effects-Driven IT Development."[12] In an empirical study

5 See, e.g., Gro Bjerknes and Tone Bratteteig, "User Participation and Democracy, and M. J. Muller, D. M. Wildman, and E. A. White, "Taxonomy of Participatory Design Practices," *Posters and Short Talks of the 1992 SIGCHI Conference on Human Factors in Computing Systems* (Monterey, CA: 1992), 34.

6 Bashar Nuseibeh and Steve Easterbrook, "Requirements Engineering: A Roadmap," in A. C. W. Finkelstein, ed., "The Future of Software Engineering," (Companion volume to the proceedings of the 22nd International Conference on Software Engineering, ICSE"00), (IEEE Computer Society Press).

7 Volkmar Pipek and Volker Wulf, "Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association of Information System* 10, no. 5 (2009): 21.

8 Kerl Bødker, Finn Kensing, and Jesper Simonsen, *Participatory IT Design: Designing for Business and Workplace Realities* (Cambridge MA: MIT Press, 2004).

9 Austin Henderson and Morten Kyng, "There's No Place Like Home: Continuing Design in Use" in *Design at Work: Cooperative Design of Computer Systems*, J. Greenbaum and M. Kyng, eds., (Hillsdale, NJ: Lawrence Erlbaum Associates, 1991), 223.

10 Pelle Ehn, "Participation in Design Things," in *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008* (Indianapolis, IN: Indiana University, 2008), 92

11 Volkmar Pipek and Volker Wulf, "Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association of Information System* 10, no. 5 (2009): 447-73; Gunnar Stevens, Volkmar Pipek, and Volker Wulf, "Appropriation Infrastructure: Supporting the Design of Usages" in *Lecture Notes in Computer Science* 5435 (Berlin: Springer, 2009): 50-69; Gerhard Fischer and Eric Scharff, "Meta-Design: Design for Designers," in *Proceedings of the Third International Conference on*

related to an electronic patient record system, they show that four types of changes need to be considered for (re-)designing a system: planned, emergent, opportunity-based, and curtailed ones. Because the latter three occur only during use, they highlight the relevance of pilot implementations. Research on "End-User Development" (EUD) also is bridging the gap between design- and use-time. Participation in the sense of EUD "empowers end-users to develop and adapt systems themselves."[13] These adaptations on a run-time level can only be realized with highly flexible software architectures.[14] Pipek and Wulf introduce the concept of "infrastructuring" for a "design in use" that involves all stakeholders over a longer period of time and provides support beyond development and adaptation: "We describe the methodological approach of *infrastructuring* to develop methodological and tool support for *all stakeholders' activities* that contribute to the successful establishment of an information system usage" (emphasis added).[15]

Muller et al. classify participative techniques along two dimensions.[16] The first is the level of user involvement: A user either can be observed or can actively participate in discussions; the second is the temporal position of the user's participation in the development process. A company can employ different techniques to encourage the exchange of information between users and developers, including interviews, surveys, questionnaires, or observation. Keil and Carmel reference "customer–developer links" that include support hotlines, bulletin boards, or trade shows.[17] In comparing different projects, they found that more successful projects employed more customer–developer links then less successful ones. S. Visser and Visser emphasize that the same users should participate not only at a single stage of the design process, but also at later ones.[18] Such "returning participants" provide more effective feedback because they already have a relatively deep knowledge of the application's concepts.

As a result of globalization and the spread of new technological facilities, development processes can be managed in more distributed settings.[19] The development in distributed projects differs from traditional ones and requires a rethinking by different stakeholders. On the one hand, the process of implementation can be *distributed*. On the other hand, user involvement can be stimulated by the use of Internet tools. Farshchian reported on a case study in which users participated in an international software development project via email and the Internet.[20] Because informal communication mainly took place asynchronously through the use of mailing lists, prototypes were the main formal reference for stimulating discussions and improvements. Such cases underline the importance of new forms of online articulation related to the design artifact.

Designing Interactive Systems: Processes, Practices, Methods, and Techniques, D. Boyarski and W. Kellogg, eds., (New York: ACM Press, 2000): 396-405.

12 Morten Hertzum and Jesper Simonsen, "Effects-Driven IT Development: An Instrument for Supporting Sustained Participatory Design," in *Proceedings of the 11th Biennial Participatory Design Conference* (New York: ACM Press, 2010), 61-70.

13 Henry Lieberman, Fabio Paternò, Marcus Klann, and Volker Wulf, *End-User Development*, HCIS Vol. 9 (Dordrecht, The Netherlands: Springer, 2006), 1.

14 Volker Wulf, Volkmar Pipek, and Marcus Won, "Component-Based Tailorability: Towards Highly Flexible Software Applications," *International Journal on Human-Computer Studies* 66, no. 1 (2008): 1-22.

15 Volkmar Pipek and Volker Wulf, "Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association of Information System* 10, no. 5 (2009): 447.

16 Michael J. Muller, Daniel M. Wildman, and Ellen A. White, "Taxonomy of Participatory Design Practices," in *Posters and Short Talks of the 1992 SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 1992), 34.

17 Mark Keil, and Erran Carmel, "Customer–Developer Links in Software Development," *Communications of the ACM* 38, no. 5 (1995): 33-44.

18 Froukje Sleeswijk Visser, and Victor Visser, "Re-using Users: Co-create and Co-evaluate," *Personal and Ubiquitous Computing* 10, no. 2-3 (2006): 148.

19 Anandasivam Gopal, Tridas Mukhopadhyay, and Mayuram S. Krishnan, "Virtual Extension: The Role of Software Processes and Communication in Offshore Software Development," *Communications of the ACM* 45, no. 4 (2002): 193-200.

20 Babak A. Farshchian and Monica Diyitini, "Using Email and WWW in a Distributed Participatory Design Project," *ACM SIGGROUP Bulletin* 20, No. 1 (1999): 11.

Stevens and Wiedenhoefer present an interesting approach to minimize the gap between use-time and design-time.[21] With their "Community Help in Context" (CHiC) concept, they provide a wiki-based help system that empowers users to extend and modify help descriptions related to the current context. This and other similar concepts can support in-situ design activities on the user-side, e.g. resulting in contextualized feedback that can be considered in later redevelopment stages. More generally, Hagen and Robertson describe evolving practices of "Participatory Design in the wild" that are made possible by social technologies.[22] Such technologies create new opportunities for user participation early in the design phase and become an opportunity for "socialising the research, bridging existing and future practices, and developing seed content."

Virtual Communities and Participation

Many Participatory Design approaches have focused on stimulating local discourses in the workplace. With the availability of the Internet, existing or future users of a product can connect to each other in a virtual/online community. Spatial limitations lose some of their importance, and the motivation for being part of such a community very often is a shared interest. Howard Rheingold characterizes virtual communities as "social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace."[23] However, everyone has their own interpretation of what connectivity in such social aggregations means: "We all have our own notion of what an online community is. It isn't hard to understand, but it is slippery to define and tricky to measure," note Lazar and Preece.[24]

Communities can be classified according to different aspects, e.g. as done by the classification from Armstrong and Hagel.[25] They distinguish between four different types of communities: transaction oriented, interest oriented, fantasy oriented, and relationship oriented. Barry Wellman proposes other categories of virtual communities, including one called communities of consumers.[26] Such communities have a product or product category as the constitutive shared interest. Users who are engaged in such communities often bring in many innovative ideas for product improvements.[27] In addition, members of such communities can contact and help each other. While profound help and recommendations from other users support the usage of a product, companies see positive commitments as an effective form of marketing.[28] With the idea of use discourse environments as a platform for "built-in" communities related to technological artifacts, we fostered user–user collaboration to support our appropriation work.[29]

21 Gunnar Stevens and Torben Wiedenhöfer, "CHIC: A Pluggable Solution for Community Help in Context," in *Proceedings of the 4th Nordic Conference on Human–Computer Interaction: Changing Roles*, Anders Morch, Konrad Morgan, Tone Bratteteig, Gautam Ghosh, and Dag Svanaes, eds., (New York: ACM Press, 2006), 212-221.

22 Penny Hagen, and Toni Robertson, "Social Technologies: Challenges and Opportunities for Participation," in *Proceedings of the 11th Biennial Participatory Design Conference*, (New York: ACM Press, 2010), 31.

23 Howard Rheingold, *The Virtual Community: Homesteading on the Electronic Frontier* (Reading, MA: Addison Wesley, 1993), 20.

24 Jonathan Lazar and Jennifer Preece, "Social Considerations in Online Communities: Usability, Sociability, and Success Factors," in *Cognition in a Digital World*, H. Van Oostendorp, ed., (Mahwah, NJ: Lawrence Erlbaum Assoc., 2003), 119.

25 Arthur Armstrong and John Hagel III, "The Real Value of On-Line Communities," in *Creating Value in the Network Economy*, Don Tapscott, ed., (Boston, MA: Harvard Business School Publishing, 1999), 173-85.

26 Barry Wellman, "Virtual Community: Introducing a New SIGGROUP Focus Area," ACM SIGGROUP Bulletin 19 no. 1 (1998): 19.

27 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "Community-Based Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006): 57.

28 Jonathan Lazar and Jennifer Preece, "Social Considerations in Online Communities: Usability, Sociability, and Success Factors," in *Cognition in a Digital World*, H. Van Oostendorp, ed., (Mahwah, NJ: Lawrence Erlbaum Assoc., 2003).

29 Volkmar Pipek, "From Tailoring to Appropriation Support: Negotiating Groupware Usage" (PhD thesis, University of Oulu, Finland, 2005).

An important theory for involving users in the design process is given with the 'Lead User Theory.'[30] Based on several studies, Franke et al. define lead users as users who fulfill two characteristics:[31] First, they are intensively engaged with the particular product and the associated market; therefore, they can discover new trends and demands in an early stage. Second, lead users anticipate advantages that lie in new technologies for themselves. These two characteristics lead to a high engagement for participation. The motivation for taking part in such design processes was explored by Füller et al., who found that users help to create an improved product that meets their personal needs better. The aspects for participation are manifold and include factors as fun, curiosity, desire to learn, personal interest, acceptance from others, and the access to exclusive information.[32] In addition, users feel more accepted and build up a deeper relationship to the producer. Von Hippel splits the process of lead user involvement into four phases.[33] In the first stage, a new trend is identified. Then, based on the users' requirements and experiences, some lead users are chosen. In the third stage, the lead users' demands are analyzed, which results in new product concepts. Finally, these new concepts are projected on a larger market. Innovations that are driven by users also are referenced in the work from Björgvinsson et al.[34] In their understanding, democratic innovation is more than a process that is *democratized* by the involvement of lead users. Instead, "democratizing innovation" practice as an alternative can appear in "an open innovation milieu where new constellations, issues, and ideas evolve from bottom-up, long-term collaborations among diverse stakeholders."[35]

The involvement of users in the design phase is not trivial. Users as well as employees have to be prepared for such a process. On the developer side, programmers often resist contributions from external stakeholders. One solution is the involvement of so-called "gatekeepers."[36] Gatekeepers have the users' as well as the employees' confidence. They connect a company with external sources by filtering relevant information in a structured way. Such gatekeepers often exist in open-source software projects. Barcellini calls them "cross-participants" because they participate in parallel discussion spaces and, therefore, may have the best overview of ideas and improvements.[37]

Füller et al. describe a concept that allows for the involvement of members of virtual communities in a structured way.[38] Called "Community-Based Innovation" (CBI), their concept can be applied in four phases. In the first phase, attributes of the users are identified that fit the requirements of the task at its best. Second, a community is identified where the key users can be found. In the third step, a virtual interaction design is developed

30 Nikolaus Franke, Eric von Hippel, and Martin Schreier, "Finding Commercially Attractive User Innovations: A Test of Lead User Theory," *Journal of Product Innovation Management* 23, no. 4 (2006): 301-15.

31 Nikolaus Franke, Eric von Hippel, and Martin Schreier, "Finding Commercially Attractive User Innovations: A Test of Lead User Theory," *Journal of Product Innovation Management* (Massachusetts: MIT Press, 2005), 301.

32 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "Community Based Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006): 57-73.

33 Eric von Hippel, "Lead Users: A Source of Novel Product Concepts," *Management Science* 32 (1986): 797.

34 Erling Bjoergvinsson, Pelle Ehn, and Per-Anders Hillgren, "Participatory Design and 'democratizing innovation'" in *Proceedings of PDC* (2010), 41-50.

35 Ibid, 41.

36 Ari Heiskanen and Jouni Similä, "Gatekeepers in the Action Structure of Software Contracting: A Case Study of the Evolution of User–Developer Relationships," in *ACM SIGCPR Computer Personnel* 14, no. 1-2 (New York: ACM Press, 1992), 30-44.

37 Flore Barcellini, Françoise Détienne, and Jean-Marie Burkhardt, "Users' Participation to the Design Process in a Free Open Source Software Online Community," *Proc. of the 18th workshop Psychology of Programming PPIG'06* (2006), 99-114.

38 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "CommunityBased Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006), 57-73.

to support communication with the users. The last step focuses on the real involvement of the users, starting with establishing contacts and resulting in design participation. This way, users can participate already in early design phases: "Members of online communities who are characterized by high product and activity involvement represent an ideal resource for co-designing products when confronted with those new methods."[39] As one of the major findings of the study, users are able and willing to participate in such a process.

Community-Driven Development

In the previous sections, we described concepts that have users somehow involved in the design and innovation process. However, none of the known studies treats users and employees with equal importance. Users can express wishes and take part in the development process, but they do not have any influence on the decisions that are finally made. As a development process that is really driven by users, we introduce "Community-Driven Development" (CDD). The concept is closely related to the traditional understanding of Participatory Design in workplace settings.[40] User representatives and IT designers work together throughout the whole development process to gain a deep understanding of demands and needs. But CDD goes beyond traditional forms of collaboration, by applying Participatory Design to the online world. Distributed users are involved, providing their knowledge and their ideas.

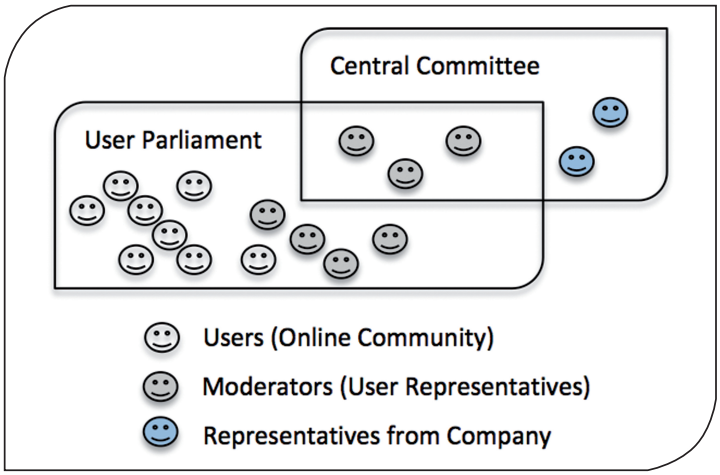
Concept

Involving users from online communities in a software design process requires room for discussions. Virtual platforms (e.g., forums) where all interested users can share and discuss their ideas and opinions provide an alternative to physical meeting places. In the CDD approach, the group of users involved in design is called the "user parliament" of the community. The company can limit the number of members in the user parliament and establish an application procedure. The concept's second institution is the "central committee," which consists of elected users and staff members who collect information and make the final decisions. As representatives from user's side, the most engaged ones are qualified for such a position. In our case, the role of "moderators" already was established (see Figure 1). Moderators are users who stay in closer contact to the staff members of the company and voluntarily contribute in helping other users. The members of the central committee play a very important role in the process; they should consequently enjoy the full confidence of both users and staff. The election process can vary from case to case, depending on aspects such as size of the community, number of existing moderators, and the available time of staff members.

39 Ibid.,

40 Kerl Bødker, Finn Kensing, and Jesper Simonsen, *Participatory IT Design: Designing for Business and Workplace Realities* (Cambridge, MA: MIT press, 2004).

Figure 1
Community-Driven Development Approach.



A democratic way to elect the representatives to the central committee would be a poll by members of the user parliament; but, several aspects make such a procedure difficult. Users in the parliament cannot estimate how much time the representatives can spend, what knowledge they have, and in which voice they speak. Moderators, on the other hand, are users and company representatives who already have earned acceptance by the community for an extended time. They are characterized by their ability to help others and stimulate discussions. Because of these already established competencies, moderators are best qualified for such a position. Moderators and staff together then elect the members of the central committee. These persons can take part in the discussions of the user parliament as private users, but in their function as committee members they should be neutral and act as moderators, if necessary. The committee hosts regular conferences, either in person or by telephone, to discuss users' ideas and interests about previously defined topics and to seek consensus on user needs. Such decisions should represent the prevailing opinions based on discussions in the user parliament. To allow for transparency and room for reflective user feedback, the results are summarized in a public space. Later on, the final decisions can be used as a central requirements specification that forms the basis for the software development process. An initial prototype should be built and given to all interested users as soon as possible, so that they can constantly test and improve it. The online forum can further be used by the user parliament to provide feedback about advantages and disadvantages of the prototypes. This input is gathered and discussed by the central committee again and then brought to the development team. From an engineering point of view, the design cycles should follow the STEPS model. In the STEPS process, developers and users work closely with each other to cooperatively generate a system specification and cyclical improve early versions.[41]

41 Gerhard Fischer and Eric Scharff, "Meta-Design: Design for Designers" in *Proceedings of the 3rd conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, D. Boyarski and W. Kellogg, eds., (New York: ACM Press, 2000), 396-405.

Use Case: CDD in a Software Design Process

Omega, a medium-sized software company developing products that help to connect personal computers and televisions (i.e., media center software) has applied the CDD concept in practice. Media center software typically offers functionalities that include pausing and recording live TV, managing existing video, audio, and image files, and streaming media files to other clients. The development of a new media center *OmegaTV* was studied as an example of the involvement of a user community in the design process.

Setting

Omega provides an online community space for its users. The portal consists of a wiki system that allows users to share their knowledge about Omega's products, and a forum that serves as a platform for information exchange (e.g., problems and potential improvements) between users and Omega employees.

An active community was established over the course of three-plus years; about 200 of the more than 15,000 registered users regularly took part in discussions. The Omega team had introduced the CDD concept both in the forum and in a weekly newsletter several months before the project started. The members of the forum had the opportunity to apply for seats in the user parliament via an online form. The original plan included only 30 persons in the user parliament, but because each applicant seemed highly motivated and reliable, all 70 applicants were allowed to serve.

The Omega staff and the moderators of the forum elected the members of the central committee. The moderators are nine private users who work on a voluntary basis and have been cooperating with Omega for a long time. All applications received for membership on the central committee were presented in the internal moderators' forum. The moderators and the staff quickly agreed on four users who were convincing because of their experienced knowledge about the product and their ability to discuss objectively. From time to time, forum discussions between users become overheated. In such cases, moderators must be able to defuse the tension and focus on the facts. From the Omega team's side, the central committee was complemented by the product manager, the product supervisor, and the quality manager.

The cooperation began with the central committee's kickoff workshop, where all members met in person. At this first meeting, Omega introduced the technical framework, provided the unalterable definitions already established by the developers, and shared the basic concept for the project procedure. The user parliament started working when the first technical preview was published, and the preview version provided a first visual representation.

Progress

The discussions of the user parliament were held in a separate forum where write access was restricted to its members. New entries could be written as text, as text with attachments, or as surveys. The members of the central committee had their own forum, as well, although it was mainly used for making appointments. Central committee members contributed their ideas and opinions to the user parliament forum. Each member of the committee specialized in a certain topic, depending on personal interest. They each took part in discussions and worked as moderators in these areas.

The product manager summarized forum discussions and sent them to the members of the central committee as a basis for the weekly conference call. In these calls, the average duration of which was two hours, previously defined topics were discussed intensively, and decisions were made. The results of every conference call were published in the wiki system. The requirements listed there served as the basis for the requirement specification the developers used to implement the system.

Methodology

We studied the use case both qualitatively and quantitatively. The quantitative analysis was concerned with the participants' forum entries. The gathered data allowed us to make statements about the community itself (e.g., how many users, how many entries), as well as about the participation of individual users with regard to certain topics over a particular period of time. The qualitative analysis included evaluation of the entries in the forum and wiki, as well as of semi-structured interviews conducted with 14 representatives of the different committees. Both users and employees were interviewed: six members of the Omega team, two of whom were members of the central committee, and eight users (four members of the user parliament and four of the central committee).

We interviewed each person twice. The interviews held at the beginning were primarily concerned with the participants' motivation and the conditions for the project. Later interviews targeted possible alterations in the participant's opinion: Did the project meet the expectations and did the attitude toward a CDD process change? The interviews with employees lasted up to 30 minutes, and those with users up to 23 minutes. All of the interviews were recorded for later analysis.

Findings

Motivation: The users' motivation for taking part in a CDD process was very high, especially at the beginning of the project. The opportunity to participate in the development process and to

bring in own ideas was considered valuable. About 2,000 entries were written in the first three weeks, and several of them were rather long. After four weeks, the discussions slowed down. Users who contributed had expressed their ideas and were waiting for first results. As soon as the first alpha version was released, the users again got heavily involved. However, of the 70 members of the parliament, only 49 persons participated in the first design process. Only 15 users took part in the project throughout the 8-month process. On the other hand, 30 new participants joined the project and provided regular contributions to discussions after the first prototype was released.

The motivation of staff members to participate in such a project was difficult to access. On the one hand, the management saw great potential, and on the other hand, the developers were quite reserved, especially at the beginning of the project. This same distinction could also be observed in the central committee: While the product manager was the main driving force, the developer participated only occasionally in discussions. From the developer's point of view, the CDD disturbed his usual work. The manager, on the other hand, had been familiar with media center systems for many years and initiated many discussions in the user parliament. Because his ideas often were accepted, he had a strong influence on the design process. This outcome does not contrast with the original concept because as member of the central committee he also was allowed to participate in the discussions of the users' parliament. In fact, the stimulating influence of the manager was observed to be absolutely necessary in structuring the process and addressing every subtopic (including several functionalities, usability, and controlling mechanisms).

Technology

One aspect we regarded as critical already in the starting phase was the technical infrastructure used to support communication. We optimistically expected that users could handle a CDD process that used the existing and familiar infrastructure (forum and wiki). But our results show that the existing infrastructure is insufficient for supporting a highly dynamic process like CDD. The separation of discussion (forum) and functional specification (wiki) resulted in an environment in which both tools were seen as independent instances with different responsibilities. For the members of the central committee, the wiki was the center of reference; for the members of the user parliament, the statements in the forum discussions were regarded as important. Another problem was the presentation of the specifications in one document. Although the wiki has a changelog function, the readability of the specification obviously did not fulfill users' needs. Furthermore, the document contained many images and screenshots so that downloading it took quite a long time, especially for users with a low bandwidth.

Organization

The subdivision of the CDD concept into user parliament and central committee has proven to be suitable in principle. However, members of the user parliament had reservations about the central committee because members of the committee were seen as favored in the direct communication with the development team staff members. Members of the user parliament thought that members of the committee kept information secret or held information back. Concerning these matters, users in the parliament stated that members of the central committee should serve on a rotating basis. Furthermore, making the communication within the committee more transparent would be valuable (e.g., by letting members of the user parliament participate in the weekly telephone conferences in a passive way or by recording the conferences and presenting the results in the online area afterwards). Another suggestion for the early stage of the design process was to use personal group discussions. Both users and representatives from the company were interested in module-oriented, face-to-face workshops. However, the planning of the physical central committee meetings generally was difficult, because of time and travel constraints. Traveling to reach a common meeting point would have been too time-intensive. In the whole process, only two meetings between the members of the central committee took place. Web conferences were, therefore, seen as alternatives to the weekly telephone conference sessions.

Another important aspect is related to a clear separation of the roles and tasks of the members of the central committee. Because everyone was responsible for everything in the first stage of the process, members of the committee asked for a clear role assignment. In the feedback interviews, they recommended that several tasks (e.g., communicating with members of the user parliament, summarizing requirements, or coordinating milestones) should be assigned to committee members so that a clear and transparent assignment of roles is made public, and the members of the user parliament would know who is responsible for a particular task. Such clarity can help to correct misunderstandings faster.

The amount of time for supervision, as well as for the whole process, is a critical issue, too. Especially for the moderators (as representatives for the user), the amount of work became crucial. One of these persons left the commitment during the project, because the personal situation (private and work) did not allow for enough time to invest in the project. Even employees of Omega mentioned that the effort of time to manage the project was much higher than was expected at the beginning of the project. A full-time employee would have been needed just for the communication with the user parliament. The process as a whole was more

time-consuming than traditional software development. The duration of a CDD process cannot be predicted exactly because users assign time for contribution individually. Nearly all the participants of the CDD process mentioned that the time frame for applying the whole project was too short.

Satisfaction

Both users and staff members learned from each other through the CDD process. The user parliament generated a number of ideas, which were gathered and discussed in the central committee. However, the restriction of a virtual discussion space comes with several limitations compared to traditional Participatory Design as described by Bodker et al.[42] The central committee members discussed issues and demands in weekly telephone calls, even though they had their own forum; and, although the conference calls generally lasted about two hours, sometimes ensuring that all voices were heard was difficult. Especially in the requirements phase, mediating between the user parliament and the central committee was challenging. An Omega staff person reflected at the end of the project: "They [the users] come to us very pragmatically with any suggestions and discuss on the basis of any visual scripts, PowerPoint pages, but [they] don't see the results afterwards. […] Many [of them]…have to see it …, and we could here not deliver enough [by discussing and defining functionalities and improvements in textual form only]." The comparison of the different reactions to the first prototype is quite interesting. Members of the user parliament were disappointed to a certain degree, while persons from the uninvolved online community gave positive feedback in the public forum. The negative comments by members of the user parliament probably resulted from the fact that the developed prototype could only be a compromise between the different suggestions (as it was defined in the public wiki documentation). Users who participated in the project may have been less satisfied because they invested time and effort making a contribution to the process, and dissatisfaction increases when suggestions offered are not considered. The whole second phase of the project ran more smoothly after the alpha versions were published continuously in intervals of only a few weeks. Because most of the criticisms mentioned were considered, the discussion was less active. After the release of the last two alpha versions, contributions often were limited to the reporting of program errors.

At the end of the study, both users and employees reported appreciating the opportunity to participate. Even though the process of the CDD was problematic at certain points, it was nevertheless "a bigger success [that] the method can apparently work and might work even better for other projects," according to one

42 Kerl Bødker, Finn Kensing, and Jesper Simonsen, *Participatory IT Design.*

employee. Except for one person, all employees were willing to conduct another CDD, although they would try to solve the now known problems. It was particularly important for them to reserve more time for the project. The users that we interviewed also saw a lot of potential in the concept: According to one member of the user parliament, "User driven development works when certain things are clearly defined, tasks are clearly distributed, the team supports it, and the communication with the users is good."

Conclusion

In this paper, we explored the involvement of a virtual user community in the whole development process of a software system. Compared to previous work, e.g. from Füller et al.,[43] we introduced the concept of a community-driven software development process, in which participants not only give feedback, but also have the power to influence decisions. The results of the evaluation underline previous work (e.g., members of an online community are able and willing to contribute; fun is an intrinsic motivation to participate; users provide valuable information). But our study also shows that especially the structures of professionalization lead to a power imbalance toward the designers' side, even if it is not intended: What started as a nice leisure activity for the users in the central committee felt like unpaid real work during the project, e.g. what became visible when a moderator left the membership in the central committee. The "work character" of user participation was also illustrated by the demand for explicit and transparent roles for certain tasks, by the perceived need for self-organization among users, and by the efficiency concerns with regard to the technological infrastructure that was used.

Using existing virtual user communities as a starting point for a Participatory Design process seems to be obvious, but the advantages of using an existing discussion culture needs to be exploited carefully. The normal discontinuities of participation in online communities can become a problem when they appear among user representatives in a process model like ours. As a consequence, we would suggest that responsibilities for the user representatives have to be framed according to the concrete use case. Personal interests, varying time to contribute, and different levels of experience may result in an unbalanced reflection of the users' needs. Instead of giving the most engaged users the power of decisions, the more valuable contribution is for them to act as mediators who summarize and reflect the previous results. Such summaries should be linked directly and integrated into the discussion and decision process. At this point, it should be clearly defined which aspects can be decided about by members of the online community (e.g., in the sense of polls as reaction to the

43 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "Community Based Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006), 57-73.

summary documents). With respect to duration and the quality of results, the process itself is hard to estimate. Nevertheless, we would advise designers to articulate the framing conditions for a CDD approach in a clear and continuously manner.

Finally, although users may be familiar with general community tools, specialized tool support might increase the quantity of participation, as well as the quality of articulations (e.g., by referring to representations of the technology). While wikis and Web forums are sufficient to run a user community, a participation process demands more specialized technological support (e.g., with respect to references to other parts of the discussion or to design aspects under consideration), even if users are already familiar with the community infrastructure. By providing more flexible tools that run on a meta-level and consider the context of use, we expect a much better integration of the participants' input in the whole design process. When design-time is supported during use-time (e.g., by allowing users to give direct feedback when a problem occurs) — on a tool level as well as on an organizational level — the process of a continuous community-driven development will run more fluidly.

When Ehn distinguished between "design for use before use" and "design for design after design," he pointed to the challenges professional designers face for the latter case.[44] Our study illustrates the challenges for users in this latter case: Democratic design comes at a cost that is difficult to estimate against the benefit one gets. Our experience with the delegation patterns described suggests that modest redesign goals and shorter redesign cycles, together with a stronger integration of these activities into use practice, could be helpful. This finding complements and concretizes the discussion around the "when" of design-in-use in our notion of "infrastructuring" with the necessary "how."[45]

44 Pelle Ehn, Participation in Design Things in *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008*, (Bloomington, Indiana, October 01 - 04, 2008, 2008), Indiana University, Indianapolis, IN, 92-101.

45 Volkmar Pipek, Volker Wulf, Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology, *Journal of the Association of Information System (JAIS)* 10, no. 5 (May 2009): 306-32.

Social Technologies: The Changing Nature of Participation in Design

Penny Hagen, Toni Robertson

Introduction

This paper is about emerging design methods that respond to the participatory, emergent, and social nature of social technologies. Social technologies are, in effect, designed through use. They are containers or scaffolds that rely on participation and user-driven contributions to take their form. Their shape emerges through the activities of use, over time, and their use is social and situated and depends on the activities of those who use them. The facilitation of participation becomes a primary concern for designers of social technologies. The embedded and contextual nature of using social technologies suggests that, when designing, evaluating and evolving new social technologies, users' experiences of, and feedback about, use are most meaningful if those users have been given the opportunity to experience the technologies in the actual context in which they will be used.

In their 2002 paper titled "PD in the Wild: Evolving Practices of Design in Use," Dittrich, Eriksén, and Hansson explored the multiplicity of ways in which design was taking place beyond the traditional boundaries of IT software development projects.[1] They highlighted the need for new Participatory Design methods and models that better supported design as ongoing and intertwined with use. In this paper, we use this concept of "Participatory Design in the wild," along with other current examples and discourse in Participatory Design, as the perspective through which to analyze our practice-led research into early design research methods suitable for social technologies and to identify new forms of participation enabled by social technologies themselves. We focus in particular on the development of social technologies in community settings where use is voluntary, and how we might facilitate participation within these settings in the early stages of their design. Specifically, we show how the use of social technologies reconfigures the traditional role of self-reporting to become an opportunity to *design through use* by enabling participants to: *socialize the research, bridge existing and future practices*, and *develop seed content*. We reflect on the potential conditions for participation that these three phenomena represent, the role of social technologies in enabling these

1 Yvonne Dittrich, Sara Eriksén, and Christina Hansson, "PD in the Wild: Evolving Practices of Design in Use," in *Proceedings of the 7th Participatory Design Conference: Inquiring into the Politics, Contexts and Practices of Collaborative Design Work* (New York: ACM, 2002), 124-34.

participation experiences, and the potential impact they suggest on how we approach early research and design of social technologies in community settings.

As Leivrow has pointed out, Participatory Design in the context of social technologies, or new media as she describes it, is *necessarily recursive*.[2] Participation is both the means of designing usable and meaningful technologies, as well as the *outcome* of successful systems. As social technologies become central to how we live our community, social, civic, political and professional lives, Participatory Design offers a critical, political frame through which these forms of "participation" can be understood.[3] Underpinning our research is a question of how the commitment to participation, as defined by Participatory Design, can be taken up in these environments; our aim is to contribute to understandings of how participatory approaches can be understood, enabled, and supported. The findings and discussion on participation reported in this paper form one aspect of a larger, practice-led research project into the impact of social technologies on participation in early design.[4]

The paper begins with a definition of the term "social technologies" and the considerations about participation that these technologies foreground for designers. We then outline participatory approaches to the design of social technologies, described as "prototyping in the wild," that have emerged as a result of, and in response to, the inherently participatory and emergent nature of social technologies. A brief summary of our empirical research is then provided. This summary is followed by a description of the findings from our practice-led work into self-reporting and the new opportunities for participation they suggest. We conclude the paper with a reflection on the significance of a participatory approach to the design of social technologies more broadly.

Social Technologies: A Definition and Focus for Design

Social technologies, also known as social software or social media, refer to the combinations of mobile and online tools and systems that enable and seek out participation and contributions by users.[5] Examples include Facebook, MySpace, Flickr, Twitter, YouTube, FourSquare, personal blogs, and discussion platforms, as well as more localized community or campaigning sites. Also integral to this landscape are mobile phones, short message servicing (SMS), picture messages (PXT) also known as Multimedia Message Service (MMS), and other personal production and communication devices and channels (e.g., instant messaging). The use of "social technologies" here is intended to refer both to the tools and to the emerging practices of connecting, producing, sharing, sending, replicating, locating, publishing, and distributing that these tools constitute.[6] Although no fixed definition of what a "social

2 Leah Lievrouw, "Oppositional and Activist New Media: Remediation, Reconfiguration, Participation," in *Proceedings of the 9th Participatory Design Conference: Expanding boundaries in design* (New York: ACM, 2006), 115–24.

3 See for example Eevi Beck, "P for Political: Participation Is Not Enough," *Scandinavian Journal of Information Systems* 14, no. 1 (2002): 77-92; and Joan Greenbaum and Kim Madsen, "PD: A Personal Statement," *Communications of the ACM. Special Issue on Graphical User Interfaces: The Next Generation* 36, no. 6 (1993): 47.

4 Interested readers can find a fuller account of the research in Penny Hagen and Toni Robertson, "Dissolving Boundaries: Social Technologies and Participation in Design," in *Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7* (New York: ACM, 2009), 129-36; Penny Hagen and Toni Robertson, "Seeding Social Technologies: Strategies for Embedding Design in Use," paper presented at DRS 2010 Conference (Montreal, Canada, 2010); Penny Hagen and Toni Robertson, "Social Technologies: Challenges and Opportunities for Participation," in *Proceedings of the Participatory Design Conference: Participation: The Challenge* (New York: ACM, 2010), 31-40; Penny Hagen, "The Changing Nature of Participation in Design: A Practice-Based Study of Social Technologies in Early Design Research" (PhD Thesis, University of Technology, Sydney, 2011); and Penny Hagen, Toni Robertson, and David Gravina, "Engaging with Stakeholders: Mobile Diaries for Social Design," in *Proceedings of the 2007 Conference on Designing for User Experiences* (New York: ACM, 2007): Article 5.

5 As social software, see danah boyd, "The Significance of Social Software," in *Blogtalks Reloaded: Social Software Research & Cases*, ed. Thomas N. Burg and Jan Schmidt (Norderstedt, 2007), 15-30; as social media, see Sirkka Heinonen and Minna Halonen, "Making Sense of Social Media Interviews and

technology" is (or isn't) is in play, social technologies can be characterized as enabling greater social participation in technology-mediated contexts.[7]

However, as Brereton and Buur point out, "participation is predicated upon delivering value to those who participate."[8] Use of social technologies in community settings is voluntary. In designing successful social platforms around which communities grow, evolve, and share, our role as designers extends beyond researching, defining, creating, and releasing a product to include how designs will be connected to, embedded within, and taken up in the world. Perhaps we might even need to bring the community "into being" as part of the project.[9] Equally, our design methods need to account for the social, participatory, and emergent nature of social technologies.

Prototyping in the Wild

One of the ways in which practitioners of Participatory Design have responded to the participatory and emergent nature of social technologies has been to extend prototyping into the settings where the technologies are being used. As a collaborative and experiential method, prototyping has always been an important part of the Participatory Design toolkit.[10] Extended "into the wild," prototyping becomes a "living form" of design research that can enable designers to co-design with community members in the context of their daily lives. Examples of this approach include the Nnub electronic community noticeboard developed by Redhead and Brereton, Botero and Saad-Sulonen's development of the Urban Mediator software, and the "Patchwork Prototyping" of collaborative software described by Twidale and Floyd.[11] In such approaches, rudimentary prototypes or "patchworks" are pulled together and then evolve *in situ* with the community, in response to use and to community feedback. Rather than undertaking traditional usability evaluations of isolated software components, existing software is repurposed to create "concrete interventions" that can be co-evolved.[12]

For Redhead and Brereton, such an embedded approach was critical to engaging participation by the community in the design of the Nnub electronic community noticeboard. They reported that traditional methods (e.g., workshops) were only attended by a few of the identified stakeholders. However, installing a functioning prototype in a local store—a location that was physically shared by many members of the community—allowed people to experience (and evaluate) the design as part of their daily lives. For these researchers, this approach was a significant departure from earlier consultative community informatics approaches; rather than seek consensus on intended use, stakeholders were able to indicate "usefulness through use itself."[13]

Narratives," SOMED Foresight Report 2 (Espoo: VTT, 2007), 6.

6 Heinonen and Halonen, "Making Sense of Social Media Interviews and Narratives."

7 danah boyd, "Social Network Sites: Public, Private, or What?," www.danah.org/papers/KnowledgeTree.pdf (accessed March 9, 2009).

8 Margot Brereton and Jacob Buur, "New Challenges for Design Participation in the Era of Ubiquitous Computing," *CoDesign* 4, no. 2 (2008): 112.

9 Carl DiSalvo, Jeff Maki, and Nathan Martin, "Mapmover: A Case Study of Design-Oriented Research into Collective Expression and Constructed Publics" in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2007), 1249-52.

10 For example, see Susanne Bødker and Kaj Grønbæk, "Cooperative Prototyping: Users and Designers in Mutual Activity," *International Journal of Man-Machine Studies*, (Special Issue on CSCW) 34, no. 3 (1991).

11 See Fiona Redhead and Margot Brereton, "Nnub: Getting to the Nub of Neighbourhood Interaction," in *Proceedings of the 10th Participatory Design Conference: Experiences and Challenges* (New York: ACM, 2008), 270-73; Andrea Botero and Joanna Saad-Sulonen, "Co-Designing for New City–Citizen Interaction Possibilities: Weaving Prototypes and Interventions in the Design and Development of Urban Mediator," in *Proceedings of the 10th Participatory Design Conference: Experiences and Challenges* (New York: ACM, 2008), 266-69; Michael Twidale and Ingbert Floyd, "Infrastructures from the Bottom-Up and the Top-Down: Can They Meet in the Middle?" in *Proceedings of the 10th Participatory Design Conference: Experiences and Challenges* (New York: ACM, 2008), 238-41.

12 Botero and Saad-Sulonen, "Co-Designing for New City-Citizen Interaction Possibilities," 269.

13 Brereton and Buur, "New Challenges for Design Participation," 111.

Floyd et al. also argue that the advantage of such an approach is that design and development decisions are based on users' actual experience of integrating the software into their everyday activities, rather than on predictions or design principles.[14] Moving prototyping into settings of everyday use provides participants with a concrete and visceral experience of use as a way to evolve and participate in design. Through this experiential process, both researchers and community members come to understand how such technologies become useful and meaningful in people's lives. For example, for Botero and Saad-Sulonen, the use of "seed prototypes" in the development of Urban Mediator enabled an understanding of how social technologies could give citizens a more active role in shaping council policies and council responses to community issues.[15] The community defined the purpose and value of the software as they used it.

The approaches to "prototyping in the wild" described here are possible because social technologies lend themselves to the deployment of simple prototypes that can be modified and evolved through feedback.[16] Twidale and Floyd argue that such approaches only exist as a result of the current ecology of information technologies.[17] Social technologies themselves become the design material, allowing the activities of researching, designing, and using to become concurrent practices. Design emerges *through everyday use*. The examples of "prototyping in the wild" outlined above help to frame and motivate the analysis of findings from our practice-led research, which we report in the following section.

Research Background: Self-Reporting with Social Technologies

The empirical research reported in this paper took place in the context of a commercial design agency committed to social change. Many of the agency's clients were motivated by the potential for social technologies to reach and engage existing and new audiences in ways meaningful to those different stakeholder groups. We were involved in practice-led research to determine early design methods that would help the design agency and its clients understand what kinds of community platforms or social media strategies would be appropriate.

Specifically, we experimented with emerging self-reporting techniques that made use of social technologies themselves as tools for self-documentation. Inspired by methods such as Mobile Probes, in which research participants use the photo function on their mobile phones to collect and share aspects of their daily lives, we also appropriated existing communication devices such as mobile phones, video cameras, and blogs as self-reporting tools.[18] The method we developed, known as Mobile Diaries, was deployed and evaluated in four different studies.[19] Participants representing potential future community members were recruited and

14 Ingbert Floyd, M. Cameron Jones, Dinesh Rathi, and Michael Twidale, "Web Mash-Ups and Patchwork Prototyping: User-Driven Technological Innovation with Web 2.0 and Open Source Software," in *Proceedings of the 40th Annual Hawaii International Conference on System Sciences* (Washington, DC: IEEE, 2007).

15 Botero and Saad-Sulonen, "Co-Designing for New City–Citizen Interaction Possibilities," 267.

16 Brereton and Buur, "New Challenges for Design Participation in the Era of Ubiquitous Computing."

17 Twidale and Floyd, "Infrastructures from the Bottom-up and the Top-Down," 238.

18 Sami Hulkko, Tuuli Mattelmäki, Katja Virtanen, and Turkka Keinonen, "Mobile Probes," in *Proceedings of the Third Nordic Conference on Human-Computer Interaction* (New York: ACM 2004), 43-51.

19 See, e.g., Hagen, Robertson, and Gravina, "Engaging with Stakeholders: Mobile Diaries for Social Design."

asked to complete diaries for a period of between one and three weeks. The goal was to provide an insight into how the particular design topic (e.g., sustainability or personal health) came to have meaning in their lives.

Participants used multi-media picture messages and video to capture and share rich, personal messages and snap-shots of their daily lives. In the last two studies, the mobile messages were sent to private research blogs or "participant mobile diaries." These diaries were created using a customized version of Wordpress, the open-source content management system (CMS), and could be accessed by both participants and researchers for the duration of the study. The use of mobile phones and blogs as self-reporting tools allowed for the real-time collation of data. This in turn enabled mutual reflection and discussion by both participants and designers, not just on the materials collected throughout the study, but also on the questions and comments they generated. Importantly, the tools and technologies used for the diaries were often the same as those used for the final, public, custom community platforms that were implemented.

Taking a participatory approach to self-reporting requires supporting participants' active involvement and influence over design. Thus, our studies have had to be open-ended and participant-led to allow participants control over what and how "data" are collected. In addition, the active role that participants have played in the interpretation of the collected material is part of their ongoing participation in the design process as a whole.[20] In the process, we found that using social technologies themselves as tools in the research and design of social technologies offered other forms of participation. The *doing* of Mobile Diaries, in addition to helping us understand what kinds of community platforms and social technologies might be appropriate, also contributed to bringing those future platforms and communities of "users" into being. We present and discuss these findings in the next section, drawing on concepts and examples from Participatory Design to explore how these findings suggest new forms of participation.

Self-Reporting as "PD in the Wild"

As a contextual method, self-reporting is already located "in the wild." However, its role in design is generally understood as a "research" or data collection technique. Using social technologies as reporting tools started to blur the boundaries of research, design, and use, creating opportunities for people to participate early in the design process *through use*. We examine from this perspective three outcomes in particular that were identified in the research as being enabled by the use of social technologies. These results included the capacity and tendency for participants to *socialize the research*, the ability to *bridge existing and future practices*, and the potential to

20 Elizabeth Sanders, "Design Research in 2006," *Design Research Quarterly* 1, no. 1 (2006): 1-8.

develop seed content. Although not traditionally valued as outcomes of self-reporting, our proposal is that these three phenomena represent potential new patterns of participation enabled and made valuable by the participatory and emergent nature of social technologies. We examine each of these phenomena in the following sections and describe how they can support forms of participation important to the early design of social technologies in community settings; in particular, we consider how they can foster participation by the "future community" and can create space for the new design to be taken up within that community as part of people's existing ecologies. We reflect on how these findings potentially reconfigure self-reporting to extend beyond a form of research data collection to become an opportunity for "PD in the wild;" we then consider the implications this transformation has for the role of methods such as Mobile Diaries.

Socializing the Research

The focus on self-reporting as a research method is most often as a personal activity, where individual participants record, reflect, and share aspects of their lives with researchers, as a precursor to design. Although there are some existing studies that document self-reporting as a shared activity, these collaborations tend to include recruited participants and are orchestrated as formal parts of the research design.[21] In our use of Mobile Diaries, social aspects of the method emerged that were initiated and defined by the participants themselves. For example, for some participants, the creation of images and video and the review of uploaded materials on the "private" Mobile Diary blog became a shared process of reflection and play, in which other family members, friends, and peers were invited to participate. Participants reported back to us that the project and the method were often the subject of discussion, and at times the experiences of participation were shared across existing networks. For example, one participant described her Mobile Diary experiences on her MySpace page while another hoped to post "self-reporting" diary material to her MySpace profile.

The conditions for *socializing the research* demonstrated here are made possible by the capacity and expectations of sociability, distribution, and sharing inherent in social technologies. In using social technologies as tools for research, we appropriated not just the technologies but also the practices of sharing and communication they make possible.

Although this sharing raises some ethical questions to consider about confidentiality for the client organization and about the need for consent from "informal participants," it also has important implications from a participatory perspective. For example, Merkel et al. suggest that in the context of community technologies, the role of designers goes beyond that of eliciting project requirements

21 For example, see research with "households" by Bill Gaver, Tony Dunne, and Elena Pacenti, "Design: Cultural Probes," *Interactions* 6, no. 1(1999); research with "friendship groups" by Wendy March and Constance Fleuriot, "Girls, Technology, and Privacy: 'Is My Mother Listening?'" in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2006), 107-10; and research with 'pairs' by Minna Isomursu, Kari Kuutti, and Soili Väinämö, "Experience Clip: Method for User Participation and Evaluation of Mobile Concepts," in *Proceedings of the 8th Participatory Design Conference: Interweaving Media, Materials and Practices* (New York: ACM, 2004), 83-92.

and includes finding ways to seed ownership.[22] We propose that the spontaneous inclusion of others in the process of self-reporting reflects a sense of control and ownership by participants over the research process, the design project, and the topic being investigated. Participants determined not just when and how documentation took place, but also with whom. We also propose the possibility that the process can be conceptualized as one of appropriation, prior to the creation of any code or system. Even without a finished artifact, the project is becoming "*a public thing open for controversies*."[23] A sense of momentum and interest is being built around the project by the "future community" as its members engage with it and give it meaning in their everyday lives and with their surrounding networks.

Given the inherently social nature of social technologies, this outcome is relatively predictable. However, such outcomes are neither accounted for in current methods of self-reporting nor particularly supported by our current methodological infrastructures. This absence raises the question of how to better support and leverage this kind of community appropriation as a form of participation central to the design of social technologies.

Bridging Existing and Future Practices

For participants, accommodating the activities of self-reporting has always meant altering their daily practices to some extent. The intervention of self-documentation facilitates reflection and at times behavior change.[24] In our case, participating in Mobile Diaries involved experiences similar to those characterizing participation in community platforms. Participants made videos, sent picture messages, created mobile blog posts (mo-blogs), and commented on blog messages—all actions common to participation in social technologies. In many cases, participants were using these technologies for the first time, learning experientially about the technologies and the various forms of interaction they allow as they produced "self-reports." Some participants said that, as a result of the study, they intended to buy camera phones or start mobile blogging. For others, the Mobile Diary experience helped them to articulate what had held them back from participating in online forums, including concerns with privacy and negative interactions with others online.

Such outcomes have a number of implications from a participatory perspective. Dearden and Light note that one of the emerging roles for designers working with community platforms is the up-skilling of community members.[25] Mobile Diaries became a playful and safe environment for participants to explore new technologies. By participating in the studies, participants had the opportunity to experiment and develop skills and knowledge relevant to participation in social technologies. In developing Mobile Diaries, participants negotiated, incorporated, and appropriated

22 Cecelia Merkel, Lu Xiao, Umer Farooq, Craig H. Ganoe, Roderick Lee, John M. Carroll, and Mary Beth Rosson, "Participatory Design in Community Computing Contexts: Tales from the Field," in *Proceedings of the 8th Participatory Design Conference: Interweaving Media, Materials and Practices* (New York: ACM, 2004), 1-10.

23 Pelle Ehn, "Participation in Design Things" in *Proceedings of the 10th Participatory Design Conference: Experiences and Challenge* (New York: ACM, 2008), 96.

24 See, e.g., Rebecca Grinter and Margery Eldridge, "Wan2tlk?: Everyday Text Messaging," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2003), 441-48.

25 Andy Dearden and Ann Light, "Designing for E-Social Action: An Application Taxonomy," paper presented at *DRS'08* (Sheffield, UK, 2008).

particular physical, social, and technical devices and practices into their daily lives, producing and sharing digital artifacts. Participants experienced something of how such technologies might take up physical, technical, and social residence in their lives.

Botero and Saad-Sulonen discuss how the use of "living prototypes" used during the Urban Mediator project created conditions not only for the development of the system but also for the practices that would make them viable.[26] We found that Mobile Diaries created a similar pathway. Self-reporting allowed participants to develop the skills necessary to participate in future designs, making this approach more viable because of the bridging of existing and future practices.

Developing Seed Content

In social technologies designed for community settings, contributors share stories, images, and experiences around topics relevant to them. The shape of the community platform evolves in response to these contributions from "community members." The use of social technologies as self-reporting tools blurred the distinction between self-reporting and the production of user-generated content. At times, there was little difference between the material participants produced during the Mobile Diaries and what we would hope to see on the user-generated sites or platforms we envisioned designing, other than the framework under which it was produced. This overlap resulted both from the subject matter of the reports (i.e., personal images, stories, and videos about a particular topic of interest, told from the perspective of the participant), and from the tools and format through which the reports were produced (i.e., MMS, blog posts, and MPEG-4 video formats developed for communication, publishing, and distribution).

For example, Mobile Diary reports included content such as the tour of a rooftop garden, home cooking experiments, and demonstrations of strategies for reducing household waste. From a design research perspective, these reports told us something of participants' motivations and interests around sustainability, but such personal stories were also ideal seed content for a future-planned community site around that same topic.

Social technologies are not about building a database and populating it with content. Rather, contributions by community members are the central, ever-evolving building blocks of design; they bring meaning to, and measure, the success of any scaffolds that we as designers might create. Content creation usually takes place after a system has been in some way formed and released to the public. The use of tools such as videos and camera phones early in the design research process meant that the creation of seed content could begin earlier, opening up the potential for the future

26 Botero and Saad-Sulonen, "Co-Designing for New City–Citizen Interaction Possibilities," 269.

platform's structure to emerge from the "bottom up."[27] Themes, navigation structures, and taxonomies thus can emerge out of the content, rather than being defined *a priori*.

The idea that material from self-reporting, usually a private endeavor, could potentially be put to more public uses raises a number of questions about privacy and consent and about how data collection is framed. It also offers potential new ways in which participants can actively influence and participate in design through activities related to use early in the design process. Managed appropriately, self-reporting studies can be used as sources of seed content, presenting an opportunity for future community members to contribute directly to the design of future platforms *through use*.

Such studies also are means through which ownership of the developing technology can be fostered. In reflecting on Context-mapping—a method that makes use of self-reporting—Rijn and Stappers state that when looking at final research reports, "users will automatically experience results with [their] personal expressions as their belongings."[28] Their research looks at fostering a sense of authorship among participants as contributors to the final reports that are created out of their research. We suggest that in the design of community platforms, the opportunity arises for the material to be taken up in the design itself. Inviting participants to take the role of author and contributor prior even to the development or specification of any particular platform creates the potential for a stronger personal connection between the design project and the participant.

Reconfiguring Self-Reporting to Support Design Through Use

Socializing the research, bridging existing and future practices and developing seed content can all be understood as examples of participation and design *through use.* Using social technologies themselves as tools for research into future community platforms created the potential for roles and activities typically acted out in use (e.g., the appropriation of design as a public object or the development of user-generated content) to be brought into the early phases of design and research. Participants engaged in a concrete experience of the modes of interaction and self-expression that constitute participation in social technologies, enabling a form of "prototyping in the wild." The direct engagement of design through use provided opportunities through which people could actively shape, influence, and take ownership in the design. Embracing this potential extends the role of methods like Mobile Diaries beyond self-documentation, reconfiguring them as exploratory interventions "in the wild" and producing rudimentary prototypes and compositions of existing social software. This creativity has implications for how

27 Twidale and Floyd, "Infrastructures from the Bottom-up and the Top-Down."

28 Helma van Rijn and Pieter Jan Stappers, "Expressions of Ownership: Motivating Users in a Co-Design Process," in *Proceedings of the 10th Participatory Design Conference: Experiences and Challenges* (New York: ACM, 2008),179.

we conceive of the potential of self-reporting to support participation early in the design process and for the role of both designers and participants.

Our experiences have encouraged us to begin thinking of Mobile Diaries less as structured research studies with a finite beginning and end and more as pilot projects or "hybrid exploratory prototypes" that can make visible, and evolve in response to, existing energies and interests within the community. Mobile Diaries might be the starting point of engagement with the future community, so that rather than closing the projects down at the end of the "research phase," the community and momentum created during the studies can evolve and keep growing. Rather than framing the Mobile Diaries as a constrained, separate and discrete research activity, they become an initial intervention that could lead the way into the next iteration or configuration. In practice, this perspective on Mobile Diaries includes adding, extending, or reconfiguring the Mobile Diary platform using existing technologies in response to participants' feedback and use. For example, we might add menus or navigation systems that reflect the ways in which participants have begun to sort and manage self-reported material. Instead of working with the community to identify specifications for development of a new artifact or platform, the goal becomes identifying "near enough" existing tools that enable co-discovery and design *through use*. Finding ways to incorporate existing technologies that already serve a particular purpose (e.g., Flickr.com for photos or Delicious.com for bookmarks) becomes the starting point for experimentation and expansion of the existing platform. For designers the emphasis is on identifying how existing tools can be brought together in ways relevant to the specific community platform being developed and developing channels through which feedback from members of the community about their use and experiences of use can be understood.

Participatory Design has long conceptualized design research as going beyond data collection to becoming participatory action research.[29] The inherently participatory nature of social technologies makes this kind of proposition more viable: Where self-reporting once represented an opportunity for designers and researchers to conduct contextual research, it now presents an opportunity for future community members to participate in design through informed through experiences of use.

The examples of "prototyping in the wild," given earlier in this paper, along with our more ad hoc experiences with self-reporting, suggest ways in which social technologies allow and prompt traditional design methods to be reconfigured to more readily engage design through use. The emergent and participatory nature of social technologies opens up new ways in which participants can have ownership and control over the design, as the shape of design

29 See Pelle Ehn, *Work-Orientated Design of Computer Artifacts* (Stockholm: Arbetslivscentrum, 1988).

can emerge through their use. However, work still needs to be done to support these kinds of approaches in the commercial sectors in which we work. For instance, the blurring of boundaries between private and public participation and the shifting roles of participants require consideration. We have begun this process by including clauses in consent forms that cover the potential to negotiate more public use of material. Technically, we would also need the resources to evolve the platform from the initial "diary" state into its next, more public form. However, as we have seen, social technologies lend themselves to exactly this sort of recomposition and reconfigurability. The real challenge is how these more "causal and exploratory formats" become manageable in a commercial context.[30] Organizations need to be culturally and politically mature enough to take on such approaches and sufficiently resourced to support the level of engagement required. A key barrier identified in our research includes a common approach to design project infrastructure that assumes a linear development between research, design, and use.[31] Whether organizations have the capacity and maturity required to allow a more participant-led design approach is also questionable. Twidale and Floyd are at pains to point out that, although the malleable nature of technologies is what makes approaches such as Patchwork Prototyping possible, the appropriate values and attitudes must also be present in the organization to allow design to emerge through use.[32]

Conclusion

In this paper, we have focused on opportunities to support participation in the design of social technologies, through use, in community settings. We have presented new opportunities for participation both demanded and enabled by social technologies themselves, and we have suggested potential implications for how we conceive of the early design of community platforms. We conclude by suggesting that such participatory approaches to the design of social technologies have a broader value. Commercial, government, and not-for-profit organizations increasingly are embracing social technologies as a way to support mass "participation."[33] Although social technologies are "participatory" in that they require and rely on participant involvement to take their form, they are not exempt from important ethical issues. We might ask who, exactly, benefits from this participation and how can we, as designers, act to maximize the benefits to the participants while avoiding their possible harm and exploitation? If we take as our starting point Greenbaum and Madsen's political perspective of Participatory Design—that people have the right to influence their own lives—then bringing a participatory approach to the design of such social technology systems is critical to ensuring that people have the ability to negotiate, control, and understand the implications of

30 Brereton and Buur, "New Challenges for Design Participation," 111.

31 Penny Hagen and Toni Robertson, "Social Technologies: Challenges and Opportunities for Participation," 7-8.

32 Ingbert Floyd and Michael Twidale, "Learning Design from Emergent Co-Design: Observed Practices and Future Directions" paper presented at *Design for Co-designers Workshop*, at the *10th Participatory Design Conference: Experiences and Challenges* (Bloomington, USA, October 1-4, 2008).

33 For example, see Hillay Cottam, "Participatory Systems: Moving Beyond 20th Century Institutions," *Harvard International Review* 31, no. 4 (2010), 50-55.

participation as they evolve.[34] Ongoing issues with privacy, ownership, opting-out, and sharing of personal information by major social network providers such as Facebook can be seen as indicators of what can occur when full participation is not at the core of the development of participatory systems.[35] The risks are not limited to a failed website with no users. As the non-consensual exposure of private data in the case of Google Buzz showed, the use of these technologies can be dangerous to people's personal safety.[36] Participatory approaches sensitize us to the inherent politics involved in participation, and, as this paper has suggested, offer some starting points for how we might integrate a more participatory approach into the systems that are now a central part of how we interact, communicate, and construct our identities in daily life.

34 Greenbaum and Madsen, "PD: A Personal Statement," *Communications of the ACM. Special issue on graphical user interfaces: the next generation*, 36, no. 6 (1993): 47.

35 See Kurt Opsahl, "Facebook's Eroding Privacy Policy: A Timeline" www.eff.org/deeplinks/2010/04/facebook-timeline (accessed May 10 2010).

36 See Nicholas Carlson, "Warning: Google Buzz Has a Huge Privacy Flaw," www.businessinsider.com/warning-google-buzz-has-a-huge-privacy-flaw-2010-2 (accessed February 10, 2010).

Community Consensus: Design Beyond Participation

Heike Winschiers-Theophilus,
Nicola J. Bidwell, Edwin Blake

"Umuntu Ngumuntu Ngabantu" Zulu proverb, translated
"A person is a person through other persons"

Dilemmas in Participation

The importance of user involvement in design activities has been widely recognized in efforts to design more usable and acceptable systems. Tools and methods used in some approaches, such as user-centered, interaction, and Participatory Design, shifted the focus to the user; nevertheless, "user involvement" remains a vague concept and a highly varied practice. Value-based approaches have heightened awareness of the need to explicitly redefine who is making the design decisions and to explicate what design processes say about users.[1] However, to date, design discourse has merely scratched the surface in unpacking meanings about participation and the ways these meanings affect design outcomes. We rarely discuss the assumptions inherent in concepts related to being human, whether as an individual or a community member (i.e., participating with others within a community), nor do we articulate how participation and design activities together define the identity of the user/community member as "the designer from within" and "the technologist/researcher/designer" as the "designer from outside" not originating from the community in which the design takes place. In this article, we propose that grappling with meanings about participation is critical to design, and in particular, to cross-cultural design. Societies and groups based on other value systems conceptualize "participation" differently, and this understanding directly affects the intercultural design process.[2]

Thus, we explore the concept of participation in design from a different viewpoint. We draw on an African philosophy of humanness—"Ubuntu," as lived through African rural community practices—to re-frame Participatory Design paradigms and methods. We reflect on our own Participatory Design interventions in Southern African communities as we explore the theoretical grounds to draw methodological conclusions for design. We then

1 Steve Harrison, Deborah Tatar, and Phoebe Sengers, "The Three Paradigms of HCI," in *Proceedings of ACM CHI 2007 Conference on Human Factors in Computing Systems*, New York, USA, 1-21.

2 Heike Winschiers-Theophilus, "Cultural Appropriation of Software Design and Evaluation" in *Handbook of Research on Socio-Technical Design and Social Networking Systems*, B Whitworth and A de Moor, eds., (Hershey, PA: IGI Global, 2009), 699-711.

propose guidelines that might enable technologists/researchers to respond more effectively in developing contextually appropriate and consensual methods in design with communities.

Localizing Design

Many attempts have been made to adapt participatory and user-centered design methods to specific regions by localizing usability measures or incorporating cultural models of people's interpersonal interactions and communicative habits into analytic tools.[3] However, our failure to successfully apply user-centered methods, evaluations, or benchmarks in developing regions,[4] or to assess the efficacy of cross-cultural projects according to "universally valid" *a priori* measures calls for the reframing of relationships between cultural contexts and meaning in design. Various critiques and approaches, emerging over the past 20 years, have motivated a reconsideration of the ways that design activities accommodate the social situation in establishing criteria of success, making decisions, and evaluating.[5] Harrison et al. applied the term "situated-paradigm" to perspectives that respond to the social context of interactions and the varied non-technological factors that affect design and use.[6] Situated paradigms, such as, value-sensitive, user-experience, critical, and Participatory Design, treat interactions of all types as a form of meaning-making in which activities, artifacts, and their context—at all levels—are mutually defining. Accounting for the many differences in approaches to participation found in designing health information systems in South Africa, Mozambique, and India, Puri et al. conclude: "There is no single algorithmic best practice regarding participatory design in information systems which is applicable to all situations."[7]

Situated paradigms favor multiple interpretations over single, objective descriptions and are thus amenable to the varying "cultural logics" that designers, users, and other stakeholders apply in undertaking and making sense of design activities.[8] Tacchi and Watkins propose that local participation must involve local interpretation to respond to the socio-economic, cultural, and political context that shapes users' behavior and actions.[9] However, identifying and applying methods that ensure local interpretations of participation and enable participants to appropriate the design process poses challenges.[10] Winschiers demonstrated that common Participatory Design methods based on Western communication structures (e.g., future workshops and brainstorming) were incompatible with Namibian user groups' social habits.[11] More compatible methods involve respecting the implicit and explicit rules that govern local practices of participation; however, designers from outside, are often unaware of these rules, or they find that the rules conflict with fundamental tenants in the development agenda. Consider, for example, that lower ranking members in

3 Elisa Del Galdo and Jacob Nielsen, *International User Interfaces* (New York: John Wiley & Sons, 1996).

4 Garry Marsden, "Toward Empowered Design," *Computer* 41, no. 6 (2008): 42-46.

5 Batya Friedman, ed., *Human Values and the Design of Computer Technology* (New York: Cambridge University Press, 1997).

6 Harrison et al., *"The Three Paradigms of HCI" (2007)*, 1-21.

7 Satish Puri, Elaine Byrne, Jose Nhampossa and Zubeeda Quraishi, "Contextuality of Participation in IS Design: A Developing Country Perspective" (Participatory Design Conference, 2004), 42-52.

8 Nicola Bidwell, Thomas Reitmaier, Garry Marsden, and Susan Hansen, "Designing with Mobile Digital Storytelling in Rural Africa" (CHI, 2010) 1593-1602.

9 Jerry Tacchi and Jo Ann Watkins, "Participatory Research and Creative Engagement with ICTs" (ACM Sensys, 2007).

10 Heike Winschiers-Theophilus, "Cultural Appropriation" (2009), 699-711.

11 Heike Winschiers-Theophilus, "The Challenges of Participatory Design in an Intercultural Context: Designing for Usability in Namibia" (Participatory Design Conference, 2006).

hierarchical societies are not expected to express opinions publicly or to non-peers, even though they are not formally prohibited from doing so. Such expectations seem unjust to those of us acculturated in egalitarian systems; indeed, we usually associate democracy with the protocols and methods required for local uptake, ownership, and domestication of information communication technologies (ICTs). Paradoxically, approaches that authorize particular stances on democracy are counter to genuine participation, as an all-inclusive paradigm, whereby all participants contribute toward a decision.

To localize participation, we must develop "sensitivity toward new types of network relations among people, the diverse motivations of people to participate, the subtle balance of values and benefits involved in collaborative endeavors, and the inherent power relations between participants."[12]

Grounding Community Consensus Theoretically

We start by describing elements of a theoretical framework that serves to ground a different way of thinking about participation. We focus on how dialogue shapes meanings of community and personhood, how practices of information exchange establish understandings about the relationship between people and information, and how through learning people can *"make and remake themselves."*[13]

Ubuntu and Dialogue

Indigenist paradigms,[14] which recognize relationships between the nature of participation and knowledge practices, motivate us to draw on local epistemologies in negotiating conflicts between culturally specific systems of participation.[15] Sensitivity to epistemologies in sub-Saharan Africa means appreciating that the way of life in rural communities associates with the paradigm that "a person is a person through other people." This sense of connectedness is encompassed in the concept of "Ubuntu," which variously means "humanity," "humanness," or "humaneness." It is related to words, aphorisms, and proverbs in many other African languages. Mbiti, one of the first writers in English on African philosophy, never used the term Ubuntu but explains that a cardinal point in the African view of humanity involves understanding that "I am, because we are; and since we are, therefore I am."[16] By including all participants' voices in building consensus, Ubuntu reflects a critical discourse. It introduces dimensions that Western discourses do not often associate with community—including a temporality beyond an individual's own life and accountability to ancestors and descendants. As Mbiti explains: "In traditional life, the individual does not and cannot exist alone except corporately. He owes his existence to other people, including those of past generations

12 Margot Brereton and Jacob Buur, "New Challenges for Design Participation in the Era of Ubiquitous Computing," *Co Design* 4, no. 2 (2008): 101-13.

13 Paulo Freire, *Pedagogy of Indignation* (Boulder, CO: Paradigm, 2004).

14 Karen Martin summarizes Indigenist research as research that is culturally safe and respectful and that emphasizes the emancipatory imperative of resistance to support political integrity and privilege Indigenous voices. In her thesis, Martin extends earlier principles for Indigenist research by 1) recognizing that Indigenous people's worldviews, knowledge and realities are distinctive and vital to their existence and survival; 2) honoring the social mores of Indigenous people as essential processes through which they live, learn and situate themselves as Aboriginal people "in their own lands and when in the lands of other Aboriginal people;" 3) emphasizing social, historical and political contexts which shape Indigenous people's experiences, lives, positions and futures; 4) privileging the voices, experiences and lives of Aboriginal people and Aboriginal lands. Martin, K. (2003). Ways of Knowing, Ways of Being and Ways of Doing: A Theoretical Framework and Methods for Indigenous and Indigenist Research, 4-5.

15 Karen Martin, "Ways of Knowing, Ways of Being and Ways of Doing: A Theoretical Framework and Methods for Indigenous Research and Indigenist Research: Voicing Dissent," *New Talents 21C: Next Generation Journal of Australian Studies* 76 (2003): 203-13.

16 John S. Mbiti, *African Religions and Philosophy* 2nd ed. Harlow (UK: Heinemann, 1990): 141.

and his contemporaries. He is simply part of the whole. The community must therefore make, create, or produce the individual; for the individual depends on the corporate group."[17]

Inclusive decision-making and participatory meetings are key traditions in rural African communities. Francophone Africans use the term *palaver* to describe how such traditions efficiently institutionalize "communicative action."[18] For instance, Congolese theologian Bénézet Bujo explains: "In seeking a solution for a problem, they share experiences, refer to the entire history of the clan community, and consider the interests of both the living and the dead. The procedure can be time-consuming as it is carried on until consensus is achieved."[19]

To illustrate the implications of Ubuntu for design, we now explore the relative identities of the community members and the designers from outside participating in design and introduce some methodological consequences. Despite the misuse and overuse of this powerful and loaded concept,[20] time and again we encounter people in rural African communities explicating the need to act together "as one person" generally and in relation to ICT projects; and time and again, we observe local expectations about "participation" in daily life.[21] To respond effectively, we must re-focus methods formalized in Participatory Design so that we emphasize facilitation of groups that have already established their existence as a whole to create a design output, rather than focusing on bringing individuals together for the purpose of undertaking a joint design activity. This approach, of course, re-ignites questions about the appropriate role of the designer from outside, in relation to already established communities during the joint design activities. To follow the Ubuntu principle, we need to identify ourselves (as designers from outside) as part of a wider community that encompasses designers from inside and outside who together derive a communal existence, and we need to acknowledge that it is within this communal existence that "I am" a designer.

A promising avenue for refining participatory approaches and enabling designers to perform identities within a communal existence distinguishes "dialogue" from "discussion." Bohm proposes that dialogue does not aim to convince others about an opinion, assert that particular concepts or solutions are the sole truth, or sum up or merge prior ideas, but is a means to create jointly new concepts and solutions by suspending judgment and respecting all contributions.[22] Such "conversations" absorb multiple perspectives and diverse aspects of settings beyond the spoken; that is, *indexicality* gives salience to actions and utterances and, reflexively, shares and augments context in creating shared meaning.[23] To generate new meanings about participation together, community outsiders must enter a lengthy process of social grounding.[24]

17 Ibid., 106.

18 Bénézet Bujo, *"Is There a Specific African Ethic?"* in *African Ethics: An Anthology of Comparative and Applied Ethics*, Munyaradzi Felix Murove, ed., (Scottsville, South Africa: University of Kwazulu-Natal Press, 2009), 122.

19 Ibid., 122.

20 Mluleki Munyaka and Mokgethi Motlhabi, "Ubuntu and Its Socio-Moral Significance" in *African Ethics: An Anthology of Comparative and Applied Ethics*, Munyaradzi Felix Murove, ed., (Scottsville, South Africa: University of Kwazulu-Natal Press, 1990), 64.

21 Nicola J Bidwell, "Ubuntu in the Network: Humanness in Social Capital in Rural Africa," *Interactions* 17, no. 2 (2010): 68-71.

22 David Bohm, *On Dialogue* (London, Great Britain: Routledge, 2007).

23 Nicola J. Bidwell, "Anchoring Design to Rural Ways of Doing and Saying," *Interact 1*, T. Gross et al., eds., LNCS 5726 (2009): 686-99.

24 Cecilia Merkel, Lu Xiao, Umer Faroog, Craig Ganoe, Roderick Lee, John Carroll and Mary Rosson, "Participatory Design in Community Computing Contexts: Tales from the Field," (Participatory Design Conference, 2004), 1-10.

Disregarding the importance, underestimating the complexity of these encounters, and curtailing the process of redefining the respective identities of designers form outside and inside contributes substantially to design failures. Generating new meanings about participation through dialogue diffracts the logics about participation that we gained in our own communities of practice. Indeed, such dialogue sensitizes us to our value-laden assumptions about participant roles and acts in participating. Because such assumptions arbitrate how we align our understandings of design with those of the community, we consider reflexive accounts about our own and community members' modes of participation to be integral to the evolving design product.

Values and Logics about Personhood in Information Transfer

Bidwell uses the lens of *Ubuntu* to illuminate the values and logics that shape participation in social networks in Africa and their link to concepts about personhood and identity.[25] Practices of information exchange reproduce values about personhood, as well as implicit theories about the relationship between people and information. The values embedded in Western modes of information exchange, such as "efficiency" and individuals' freedom to express (including expression of information) are shaped by media traditions, including writing systems and "secondary orality." In contrast, African rural communities often preserve strong oral traditions, which intertwine with certain values and logics in their local knowledge systems. For instance, speakers frequently personalize and control access to information according to their knowledge about the listener, and this approach contributes to constructing both the speaker's and listener's identities.[26]

Recognizing how power relations between systems of information exchange can undermine certain values and logics can be extremely difficult. For instance, attributing the cognitive abilities of detachment and objectivity to written literacy arises within particular perspectives on modernity, "progress," and writing systems.[27] Often we adopt a "deficit approach" to differences and, by using methods to compensate for "illiteracies" of some sort, unwittingly deemphasize those logics and skills in which we ourselves are illiterate. Consider how accounts about cognitive abilities tune designing for oral users;[28] simultaneously, they neglect relations between verbal explanations, specific literacy, or schooling practices and disregard the acute linguistic awareness of multilingual people, who are many in Africa.[29] They thus marginalize the work people do in face-to-face communication. Imposing systems that neglect core features of information transmission can undermine the literacies people apply in participation and consequently can displace local knowledge traditions in developing ICTs.

25 Nicola J. Bidwell, Ubuntu, See note 21, 68-71.

26 Nicola J. Bidwell, Heike Winschiers-Theophilus, Gereon Koch Kapuire, and Matthias Rehm, "Pushing Personhood into Place: Situating Media in the Transfer of Rural Knowledge in Africa," *International Journal of Human-Computer Studies* (Special Issue on Locative Media) 69, no. 10 (2011): 618-31, K. Cheverst and K. Willis, eds.

27 See Sylvia Scribner and Michael Cole, *The Psychology of Literacy* (Cambridge, MA: Harvard University Press, 1981), and Russell Kaschula, ed., *African Oral Literature: Functions in Contemporary Contexts* (South Africa: New Africa Books, 2001).

28 Jahanzeb Sherwani, Nosheen Ali, Carolyn Penstein Rose, and Roni Rosenfeld, "Orality-Grounded HCID: Understanding the Oral User," *Information Technologies and Development* 5, no. 4 (2009): 37-49.

29 See Glynda Hull and Katherine Schultz, "Literacy and Learning Out of School: A Review of Theory and Research," *Review of Educational Research* 71 (2001): 575-611 and Ruth Finnegan, *The Oral and Beyond: Doing Things with Words in Africa* (Oxford/Chicago: James Currey/University of Chicago Press, 2007).

Scholarship of African orality includes linguistic and "extra-linguistic" acts, such as gesture, movement, crafts, and performance.[30] Rather than eventuating in print or a technological artifact, information is continuously recreated, accreted, and distributed across groups. As Sherwani et al. remark, when a community emphasizes oral transfer, all information "is traceable to a person."[31] The design implications of local values associated with and expressed by the personal pedigree attached to information are nicely illustrated by our experience in evaluating a sophisticated decision support system, based on ecological models about southern African farming. The system neglected the way that farmers draw on their lived familiarity with people in assessing the relevance and integrity of information; the farmers participating in the evaluation were uninterested in the system's logical reasoning or the decision paths displayed by our initial interface and instead wanted information about people they knew who had followed the proposed decision.[32] Sometimes we try to reconcile different approaches to information exchange by emphasizing similarities at the expense of noticing differences. Consider storytelling, for example: Many African oral traditions use stories to transfer information, whether in everyday speech (e.g., the idioms and proverbs that inundate rural vernaculars of isiXhosa) or in bounded activities (e.g., story-telling around the evening fire). We widely accept the importance of storytelling to design practice, and telling stories are core to many Participatory Design methods and user-centered design tools.[33] Such approaches reproduce particular customs of storytelling, conceptions about stories, and narrative conventions (e.g., chronology and linearity), which are shaped by Western media traditions. However, African storytelling traditions have their own narrative forms and aural, visual, and kinaesthetic qualities.[34] Further, our views of where a story "comes from" and who is permitted to voice it are cultural; for instance, a Western constructivist view—that authors control narrative and listeners determine meaning—is in stark contrast to cultures where stories are "owned" by ancestors or the land or where deep familiarity between speakers and listeners and their respective social relations can limit multiple meanings.[35]

Mutual Learning in Dialogue

A commitment to generate new meanings about participation through dialogue, and to revise norms about participants' roles involve envisioning and realizing an environment conducive to mutual learning among designers form outside and local community members. Freire concedes that dismantling the dichotomy between the people who know and those who do not (yet) know requires the marginalized to be active in their own emancipation.[36]

30 Finnegan, *The Oral and Beyond*.

31 Sherwani et al.,"Orality-Grounded HCID," 37-49.

32 Heike Winschiers-Theophilus, Jens Fendler, Dave Joubert, Ibo Zimmermann, Colin Stanley, and Sebastian Mukumbira, "A Bush Encroachment Decision Support System's Metamorphosis," (OZCHI, 2008): 287-90.

33 Nicola Bidwell et al., "Designing with Mobile Digital Storytelling,"1593-1602.

34 For narrative forms, see Finnegan, *The Oral and Beyond*; For aural, visual, and kinesthetic qualities, see Kaschula, *African Oral Literature*.

35 Nicola Bidwell et al., "Pushing Personhood into Place," 618-27.

36 Paulo Freire, *Pedagogy of Indignation*.

The literature reports different approaches to alleviating conceptual and practical gulfs between designers from outside and users in Africa. For example, Walker et al. suggest this approach: "[T]rain local people to take on design roles and self-report their progress with the technology as participant ethnography."[37] Explicitly acknowledging local knowledge by recognizing community members as fellow researchers reveals insights into local understandings about, and use of, technology that would not otherwise emerge. Co-generating techniques for gathering data is particularly enriching because local appropriations of methods, which established disciplines would regard as lacking rigor, reveal how communities construct the objects and relations of enquiry.[38]

On the other hand, literacy on ICTs is a prerequisite for involvement in design.[39] Designers often simultaneously assume the roles of both facilitators and change agents, which is inherently problematic. To create common understandings about ICT that are compatible with a community's priorities, activities must permit stakeholders to explore options safely and to make choices about adopting outside knowledge or altering current practices gradually.[40] Many design disciplines widely accept that people understand issues and options by creating and testing possible solutions and reflecting on outcomes.[41] In addition, prototypes have proven particularly useful in catalyzing discussions, eliciting observations of use, and envisioning future use.[42] Blake and Tucker suggest adapting methods from agile and evolutionary software engineering under the umbrella of action research, as a paradigm rather than a methodology.[43] Action research encompasses cycles of intervention and reflection. Each design iteration reveals to user groups both the possibilities and the malleability of ICTs, as well as to designers the many factors that situate their use.[44] Designers are technology interventionists who materialize their understanding of aspects of local context in prototypes, and user groups are respondents who materialize their ideas about the possibilities for ICT by using, or not using, prototypes. Throughout, the phases of action and critical reflection on action lead to a shared understanding of design itself and a continuous transformation of the environment for participation.[45]

From Expert to Apprentice

To illustrate and elaborate on some of the challenges and nuances of the theoretical considerations outlined in the previous section, we draw upon our experiences with one particular African rural community project in Namibia. In 2008, we established a research agenda to appropriately translate an African indigenous knowledge system into technology. We sought to support the knowledge that rural communities have produced, over generations, despite

37 Kevin Walker, Joshua Underwood, Tim Waema, Lynne Dunckley, Jose Abdelnour-Nocera, Rosemary Luckin, Cecilia Oyugi, and Souleymane Camara, "A Resource Kit for Participatory Socio-Technical Design in Rural Africa," (CHI, 2008): 2709-14.

38 Nicola Bidwell et al., "Pushing Personhood into Place," 618-27.

39 Andre Maunder, Garry Marsden, Dominic Gruijters, and Edwin Blake, "Designing Interactive Systems for the Developing World: Reflection on User-Centred Design," in *Proceedings IEEE/ACM International Conference on Information and Communication Technologies and Development* (ICTD, 2007): 321-28.

40 Walker et al., "A Resource Kit," 2709-14.

41 Geraldine Fitzpatrick, *The Locales Framework: Understanding and Designing for the Wicked Problems*, Computer Supported Cooperative Work 1, 17 (2-3): 91-96 (Dordrecht, The Netherlands: Kluwer Academic Publishers, 2003).

42 Margot Brereton and Jacob Buur, "New Challenges for Design Participation," 101-13.

43 Edwin Blake and William Tucker, "Socially Aware Software Engineering for the Developing World," (IST Africa, 2006).

44 Edwin Blake, "Software Engineering in Developing Communities," in *CHASE'10: Proceedings of the 33rd International Conference Software Engineering Workshop on Cooperative and Human Aspects of Software Engineering*, New York ACM, (2010) 1-4.

45 Edwin Blake, "How to Provide Useful ICT When Called Upon," *Interactions* 13, no. 5 (2006): 20-21.

ongoing interruptions to information transfer caused by urban–rural migration and modernization. Our major design challenge is to reconcile data structures, retrieval mechanisms, and user interfaces with local African orality. The full involvement of rural community members is indispensable because outsiders to these communities of practice can never fully comprehend the knowledge system. However, such involvement poses numerous hurdles, including linguistic gulfs, differing agendas and roles of individual participants, the dynamics of managing and controlling design processes, trust and acceptance, and the type of interactions. To start to address these hurdles, we sought a common framework that might be embodied in the principle of Ubuntu.[46]

Participant Identities

Our design team consisted of about 20 community members of the Herero tribe at two sites in eastern Namibia and eight designers of different ages and genders: four who were based in Namibia's capital, two who were based elsewhere in southern Africa, and two based in Europe. One team member, both a designer and a member of one of the rural communities, had well-established, trusting, and respectful relationships with wise elders who reside in the villages. Our team's composition meant we performed and embodied distinct identities, situated in different research contexts.

In the capital, the senior designers were the main actors in the project's planning, processes and reporting. The Namibian-based designers triggered the original goal of generating an indigenous knowledge management system and invited other senior and student designers to join them. We, the senior designers, readily admitted that, in our entrapment within our own conceptualization of knowledge and ICT solutions, we could not design for the community, but instead acted as enablers. Thus, the designer who originated from the village served as the main actor - assuming a distinct third role in interactions by translating conversations with and between community members - all of which were conducted in Otji Herero. He thus performed two identities in the context of our research and the rural community. Being young, relative to the village elders, he was expected to listen actively but not to interrogate or initiate actions. At the same time, he provided the necessary linguistic and cultural translations, such that translation did not disturb the flow of interactions but delicately balanced the design activities. Younger and/or female designers, regardless of their experience, adopted the host communities' customarily passive roles in interactions; and this demeanor reinforced the influence of the designer from the village in interactions with community members.

46 Heike Winschiers-Theophilus, Nicola J Bidwell, Edwin Blake, Shilumbe Chivuno-Kuria, and Gereon Koch Kapuire, "Being Participated: A Community Approach," in *Proceedings of the Participatory Design Conference 2010. Participation: The Challenge*, (Sydney, Australia: ACM, 2010): 1-10.

Our behavior in the villages thus reinforced the performance of customary identities. For example, to engage with and abide by local protocol, we consulted with and properly informed the elder, who was familiar with leading dialogue and consensus-decisions, about proposed participatory sessions before informing other community members. We remain uncertain about whether community members recognized their ownership and active role in designing the system. Before this project began, many had not used a cell phone or computer, and their initial comments suggested that they did not relate their traditional knowledge to economic benefit. Rather, they felt flattered by our consultation, emphasized the importance of their knowledge to their identity, and expressed hopes that recordings of daily life and practices might raise wider awareness of their need for basic services (e.g., water and electricity) and ICT. We compensated community members—with food hampers—for their availability and participation in the research activities and conversations, hoping to express in a locally meaningful way how we valued their participation and knowledge. However, we did so fully aware that such behaviors express power relations and might inherently privilege certain concepts about intellectual property over a local logic of communal knowledge.

Oscillation in Design Processes Control

Throughout our repeated stays in the villages, community members accommodated project activities within their busy daily schedules. Initially, we found ourselves anxiously wondering whether our intended activities, which needed to happen primarily in daylight, would happen. Over time, we learned to accept that events rarely happened according to our plans but that adjusting to the community's rhythms was essential for activities to absorb vital local values about dialogue. That is, we learned to appreciate that the social focus of villagers' unhurried activities are a purposeful part of community practice.

During each visit, we oscillated through different modes of participation. The designers from outside sometimes participated in community-initiated activities, which either occurred routinely or were intended to guide us; at other times, community members participated in our activities, including contextual interviews, technology probes, prototype evaluations, and reflections.[47] The non-planned, community-driven activities were deemed equally important in the overall design exercise, complementing our ethnography.[48] Experiencing community practices led us to better assess the adequacy of design methods and decisions, and participating in community-driven activities contributed to a framework within which to build consensus. As designers, we recognized that such an approach starts to address the power relations that can

47 Heike Winschiers-Theophilus et al., "Being Participated," 1-10.

48 Nicola Bidwell, Heike Winschiers-Theophilus, Gereon Koch Kapuire, and Shilumbe Chivuno-Kuria, "Situated Interactions Between Audiovisual Media and African Herbal Lore," *Personal and Ubiquitous Computing* 15, no. 6 (2011): 609-27.

intimidate and inhibit participants.[49] However, this approach also suggests the need to balance expectations about processes and outcomes. The slow production of concrete outcomes can frustrate both designers and community members. Designers do not always recognize the role of community-initiated activities on design outcomes and, especially if they are unfamiliar with rural Africa, may feel they waste valuable time in the field. In addition, our deliberate suspension of ideas, intended to avoid pre-empting local design suggestions, can confuse community members who expect a finalized system.

Guidelines for Community Design

Our lived experience in this project, together with our ongoing situated research elsewhere in rural Africa, yields various issues that require further research and discourse in striving for a more consensual approach to design.

Being Participated

Designing with rural communities built on intricate kin relations and established over many generations differs radically from designing for organizations or individuals. Any interaction takes place within a network of people whose links are not necessarily transparent to outsiders. We conduct all usability evaluations and design sessions in rural communities with group members who have been assigned by those communities. This approach has proven very effective in eliciting spontaneous and informative discussions about design, which would not have occurred in an individual setting. By drawing on the concepts of Ubuntu, we place the people's interactions and interrelations at the heart of each encounter. We devote significantly more time to speaking and listening and undertake many activities, intended to establish and sustain collaboration that would be branded irrelevant by classical design strategists. When community members outnumber designers from outside and are in their own familiar environment, they often lead the participatory interactions. Their continuous deviation from the schedules, processes, and aims of the activities we plan contributes to our sense of *"being participated."* Initially, this sensation of losing design process control is uncomfortable; however, as we have reflected on the interactions, we feel a sense of release about the community's empowerment in controlling the process.[50]

Situated Redefinition

We have referred to differences in the values and logics of Western and African societies that influence concepts of participation in design. In most sub-Saharan rural communities, "participation" is well-established, and collaboration incorporated in everyday

49 Sherwani et al., "Orality-Grounded HCID."

50 Heike Winschiers-Theophilus et al., "Being Participated," 9.

activities.[51] Thus, facilitating participation is not about cultivating a composite of disparate individuals but about contributing to an environment where interactions can influence design. To make appropriate participation possible, we need to observe, reflect on, and respond to local values because every design situation presents unique flavors of participants' identities, viewpoints, agendas, and roles within their community. Thus, mutual learning informs the design *processso* that common concepts, such as "participation," are defined within the design context.

Changing Roles

Participation in influencing the design process means that both designers and community members influence the design outcome. However, the former risk, consciously or unconsciously monopolizing the process, and subverting local norms in their choice of methods and modelling techniques. To locate the design process in the community, designers must develop a particular sensitivity to their own bias and embrace a change of role from meta-participants (e.g., facilitator) to a participant; they must adjust to appropriate joint interactions and translate these adjustments into implementations. In such contexts, designing by consensus redefines the nature of the common roles in Participatory Design, requiring oscillation between roles as facilitators, interventionists, observers and interpreters.

Conclusion

We have illustrated how local values and logics shape participation in design within a specific rural community context and have drawn upon the philosophy of Ubuntu to explicate a new meaning for participation. Local practices in many sub-Saharan African regions express the values and logics of Ubuntu, which suggests we can generalize some lessons for other projects in rural African communities. Further, we propose that embracing Ubuntu into design thinking enhances more meaningful participation in contexts in which the socio-economic access to technological innovations and the epistemological circumstances of designers and user groups differ acutely.

Our position here is a partial answer to colleagues working with indigenous groups or across cultures who assert that "Participatory Design does not work!" A key aspect of our role as designers lies in acknowledging that, as part of a community of participants, we must embrace the experience of "being participated." Working in rural Africa is replete with opportunities for such experiences—opportunities that enable us to revise our concepts about participation and contribute our revisions to our share of final products. Rather than actively facilitating participation according to our own definitions of participation, we are

51 Nicola J. Bidwell et al., "Pushing Personhood into Place," 618-31.

responsible for integrating the communities' participatory practices so that participants are able to appropriate the design process. This perspective assumes a commitment to mutual learning. On the one hand, we need to acquire sufficient local knowledge to contribute methods that respect communication protocols, and, on the other hand, communities need sufficient exposure to technology to contribute actively to detailed design decisions. Continuous reflection on actions and technology interventions by all participants throughout the design process helps to re-align methods and decisions and shape the design process itself, such that together we transform the environment and resituate participation.

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Design Things and Design Thinking: Contemporary Participatory Design Challenges

Erling Björgvinsson, Pelle Ehn, Per-Anders Hillgren

Introduction

Design thinking has become a central issue in contemporary design discourse and rhetoric, and for good reason. With the design thinking practice of world leading design and innovation firm IDEO, and with the application of these principles to successful design education at prestigious d.school, the Institute of Design at Stanford University, and not least with the publication of *Change by Design*, in which IDEO chief executive Tim Brown elaborates on the firm's ideas about design thinking,[1] the design community is challenged to think beyond both the omnipotent designer and the obsession with products, objects, and things. Instead, what is suggested is: (1) that designers should be more involved in the big picture of socially innovative design, beyond the economic bottom line; (2) that design is a collaborative effort where the design process is spread among diverse participating stakeholders and competences; and (3) that ideas have to be envisioned, "prototyped," and explored in a hands-on way, tried out early in the design process in ways characterized by human-centeredness, empathy, and optimism.

To us this perspective sounds like good old Participatory Design, although we have to admit it has a better articulated and more appealing rhetoric. As active researchers in the field of Participatory Design for many decades, we fully embrace this design thinking orientation. However, we also hold that, given design thinking's many similarities to Participatory Design today, some of the latter's challenges also might be relevant to contemporary design thinking. In this paper we put forth both some practical-political and some theoretical-conceptual challenges and dilemmas in engaging in design for change. We do so using the background of our own idiosyncratic encounters with the field and our view on how Participatory Design as a design practice and theoretical field has emerged and evolved since the early 1970s.[2]

1 Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (New York: HarperCollins Press, 2009).

2 See, e.g., Erling Björgvinsson, *Socio-Material Mediations: Learning, Knowing, and Self-Produced Media Within Healthcare*, PhD Dissertation Series 2007-03 (Karlskrona: Blekinge Institute of Technology, 2007); Pelle Ehn, *Work-Oriented Design of Computer Artifacts: Arbetslivscentrum* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1988); and Per-Anders Hillgren, *Ready-Made-Media-Actions: Lokal Produktion och Användning av Audiovisuella Medier inom Hälso- och Sjukvården (Ready-Made-Media-Actions: Local Production and Use of Audiovisual Media within Healthcare)* (Karlskrona: Blekinge Institute of Technology, 2006).

In this paper, we argue that a fundamental challenge for designers and the design community is to move from designing "things" (objects) to designing Things (socio-material assemblies). We also argue that this movement involves not only the challenges of engaging stakeholders as designers in the design process, as in "traditional" Participatory Design (i.e., envisioning "use before actual use," for example, through prototyping), but also the challenges of designing beyond the specific project and toward future stakeholders as designers (i.e., supporting ways to "design after design" in a specific project). We see this movement as one from "projecting" to one of "infrastructuring" design activities. As further reflections on these challenges, we discuss our ongoing "infrastructuring" engagement in Malmö Living Labs as one in which we design "Things" for social innovation. We conclude by returning to design thinking and exploring the further challenges to infrastructuring and to open "design Things."

Designing: From "things" to Things

As background, we suggest the need to revisit, and partly reverse, the etymological history of "things," as well as the political history and the value base of Participatory Design. The etymology of the English word "thing" reveals a journey from the meaning of a social and political assembly, taking place at a certain time and at a certain place, to a meaning of an object, an entity of matter. Originally, "Things" go back to the governing assemblies in ancient Nordic and Germanic societies. These pre-Christian Things were assemblies, rituals, and places where disputes were resolved and political decisions made. The prerequisite for understanding this journey from things as material object and back to Things as socio-material assemblies is that if we live in total agreement, we do not need to gather to resolve disputes—because none exist. Instead, the need for a common place where conflicts can be negotiated is motivated by a diversity of perspectives, concerns, and interests.

Our starting point in this paper is participation in Things—these kinds of socio-material assemblies that Bruno Latour so strikingly has characterized as collectives of humans and non-humans.[3] We argue that this shift of meaning in the word "thing" is of interest when reflecting on how we as designers work, live, and act in a public space of design—a space that permits a heterogeneity of perspectives among actors who engage in attempts to align their conflicting objects of design. How can we gather and collaborate in and around *design Things*—Things that are modifying the space of interactions and performance and that may be explored as socio-material frames for controversies, opening up new ways of thinking and behaving, being ready for unexpected use.[4]

3 Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999).

4 This frame or structure is also used for the book *Design Things* by Thomas Binder, Pelle Ehn, Giorgio de Michelis, Per Linde, Giulio Jacucci, and Ina Wagner (Cambridge, MA: MIT Press, 2011), in which we explore socio-material foundations for contemporary design from a pragmatic perspective. Ideas in this paper are dealt with in much more detail in the book.

Participatory Design, seen as design of Things, has its roots in the movements toward democratization of work places in the Scandinavian countries. In the 1970s participation and joint decision-making became important factors in relation to workplaces and the introduction of new technology. Early Participatory Design projects addressed new production tools, changes in production planning, management control, work organization, and division of labor from users' shop floor perspective.[5]

Participatory Design started from the simple standpoint that those affected by a design should have a say in the design process. This perspective reflects the then-controversial political conviction that controversy rather than consensus should be expected around an emerging object of design. In this situation, Participatory Design sided with resource-weak stakeholders (typically local trade unions) and developed project strategies for their effective and legitimate participation in design. A less controversial complementary motive for Participatory Design was the potential to ensure that existing skills could be made a resource in the design process. Hence, one might say that two types of values strategically guided Participatory Design. One is the social and rational idea of democracy as a value that leads to considerations of conditions that enable proper and legitimate user participation—what we refer to here as "staging" and "infrastructuring" *design Things*. The other value might be described as the idea affirming the importance of making participants' *tacit knowledge* come into play in the design process—not just their formal and explicit competencies, but those practical and diverse skills that are fundamental to the making of things as *objects* or *artifacts*.[6]

Hence, Participatory Design, as it emerged in the 1970s, might theoretically and practically be seen as a "modern" example of Things (or rather "thinging," as Heidegger would call it). Latour has called for a thing philosophy or object-oriented politics.[7] His explicit references to object-oriented programming are interesting, not least because a key actor in the early formation of Participatory Design in Scandinavia, Kristen Nygaard, also was one of the inventors of object-oriented programming. For our purposes, however, we focus on participation in *design Things* and on strategies for "infrastructuring" them. Included in this focus is the design of objects as "matters of concerns." So *design Things* are in focus when inquiring into the "agency" not only of designers and users, but also of non-human "actants," such as objects, artifacts, and design devices. How do they get things done their way? How are design and use related? How do design projects and design processes align human and non-human resources to move the object of design forward? How might designers participate in these Things and position themselves in the "collectives of humans and non-humans?"

5 Ehn, *Work-Oriented Design of Computer Artifacts*.

6 Ibid.

7 Bruno Latour, "From Realpolitik to Dingpolitik or How to Make Things Public" in Bruno Latour and Peter Weibel, eds., "Making Things Public: Atmospheres of Democracy" in *Catalogue of the Exhibition at ZKM – Center for Art and Media – Karlsruhe, 20/03-30/10 2005* (Cambridge, MA: The MIT Press, 2005), 4-31.

As the paper evolves, two "thinging" approaches emerge. In the first, Participatory Design is characterized as an approach to involve users in the design and, as suggested by Redström, to encounter in the design process use-before-use.[8] In such a "traditional" approach, Participatory Design is seen as a way to meet the challenges of anticipating or envisioning use before actual use, as it takes place in people's lifeworlds. A complementary position suggests deferring some design and participation until after the design project, opening up the possibility of use as design, or design-after-design.[9] This approach means design as "infrastructuring," addressing the challenge of design as ongoing and as anticipation or envisioning of potential design that takes place in use after design in a specific project.

Thinging: From "Projecting" to "Infrastructuring"

The *project* is the socio-material Thing that is the major form of alignment of design activities. A project is the common form for aligning resources (people and technology) in all larger design endeavors. Projects are Things that have objectives, time lines, deliverables, and more. In practice, resources that must be aligned in a design project might include project briefs, prototypes, sketches, ethnographies and other field material, buildings, devices, project reports, "users," engineers, architects, designers, researchers, and other stakeholders.

Projects often are designed to go through a number of consecutive stages of gradual refinement. They typically have names like "analysis," "design," "construction" and "implementation." However, the shortcomings of such an approach are well-known and many: the top-down perspective hindering adaptation to changing conditions, the hierarchical structure adverting "legitimate" participation, the rigidity of specifications. Hence, the call for user involvement and Participatory Design approaches.

Rather than thinking of a project as a design Thing consisting of the four phases of analysis, design, construction, and implementation, a Thing approach would see this as a collective of humans and non-humans and might rather look to the performative "staging" of it. Inspired by Pedersen, we could then consider these questions:[10] *How do we construct the initial object of design for a project? How do we align the participants around a shared, though problematic or even controversial, object of concern? How do we set the stage for a design Thing?* As work proceeds, *how can the involved practices be made reportable* (e.g., fieldwork, ethnographies, direct participation)? *How can the object of design be made manipulatable*, enrolling the participating non-human actors represented in forms that can be experienced (e.g., sketches, models, prototypes, and games)? *How are the objects of design and matters of concern made into public*

8 Johan Redström, "Re:definitions of Use," *Design Studies* 29, no. 4 (2008): 410-23.

9 Ibid.

10 Jens Pedersen, "Protocols of Research and Design" (PhD thesis, Copenhagen IT University, 2007).

Things and opened to controversies among participants, both in the project and outside it (e.g., negotiations, workshops, exhibitions, public debate)?

However, as Klaus Krippendorff has pointed out, projects are only part, or a specific form, of alignments in the life cycle of a device, and every object of design eventually has to become part of already existing ecologies of devices, in people's already ongoing lifeworlds.[11] Hence, both the beginning and end of a designed device is open and hardly ever constrained to the limits of the project. This openness is principally interesting because it emphasizes the importance of understanding how design in a project is related to user/stakeholder appropriation, be it as adoption or redesign, and how users make it part of their lifeworld and evolving ecologies of devices. Hence, strategies and tactics of design *for* use must also be open for appropriation *in* use, after a specific project is finished, and consider this appropriation as a potential, specific kind of design.

Participatory Design Things and Use Before Use

Early attempts to conceptualize Participatory Design were made by referring to Wittgenstein and the language-game philosophy.[12] Design was seen as meaningful participation in intertwined language-games of design and use (professional designers and professional users); whereas, performative design artifacts, such as mock-ups, prototypes, and design games, could act as boundary objects binding the different language-games together.[13]

With this conceptualization followed the specific design challenge of setting the stage for another specific design language-game—one that has a family resemblance with (professional) language-games of different stakeholders, especially users (lay-designers) and (professional) designers. Thus, in the language of this paper, this staging meant literally assembling socio-material *design Things*, with potentially controversial design objects and matters of concern. The focus thus shifted to *socio-material Things as assemblies* rather than being on *things as objects*.

This shift led to recommendations and practices for a design process based on the (work) practices of legitimate but resource-weak stakeholders (i.e., actual or potential "end-users"). Work ethnographies and other ways to focus on the users' understanding became central. So did engaging in participative design activities, such as participative future workshops.[14] But the most significant shift was the replacement of systems descriptions with engaging hands-on design devices, like mock-ups and prototypes and design games that helped maintain a family resemblance with the users' everyday practice and that supported creative, skillful participation and performance in the design process. A decisive

11 See Klaus Krippendorf, *The Semantic Turn: A New Foundation for Design* (Boca Raton, FL: Taylor & Francis Group, 2006).

12 Ludwig Wittgenstein, *Philosophical Investigations* (Oxford: Basil Blackwell, 1953).

13 See Ehn, *Work-Oriented Design of Computer Artifacts*; see also Susan L. Star, "The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving," in *Distributed Artificial Intelligence* 2, Les Gasser and Michael Huhns, eds. (San Francisco: Morgan Kaufman, 1989), 37-54.

14 Robert Junk and Norbert R. Müllert, *Zukunftswerkstätten: Wege zur Wiederbelebung der Demokratie* (Future workshops: How to Create Desirable Futures) (Hamburg: Hoffmann und Campe, 1981).

shift in design approach occurred when user participation as design-by-doing and design-by-playing became ways to envision use-before-use.[15] The shift came on the heels of a breakdown in communication between designers and users (lay designers) in using more traditional design methods. These methods did not make sense to all participants.

There are striking similarities here between how we started to use design-by-doing and design-by-playing design artifacts in participatory projects in the early 1980s (e.g., supporting graphic workers and their unions in shaping new technology and work organization in newspaper production) and the focus on prototyping and role-playing as creative tools in contemporary design thinking.[16]

Note that this view on design Things as intertwined language-games, with its focus on the relation between designers and users, was developed in the societal context for, and discourse around, democratization of the workplace in Scandinavia in the 1970s. In practice, design Things did not stand alone. They were linked to other Things—especially to a formal "negotiation model" for design projects focusing on skills and work organization, intended to strengthen the voice of workers and their local trade unions in negotiations with management and in controversies around the design and introduction of new technologies at the workplace.[17]

What, then, is the role of non-human "participants," such as design devices in the form of prototypes, mock-ups, design games, models, and sketches in design Things? In project work, a strong focus is placed on "representations" of the object of design. Traditionally, these representations are thought of as gradually more refined descriptions of the designed object-to-be. The suggestion here instead is to focus on these devices as material "presenters" of the evolving object of design supporting communication or participation in the design process. This evolving object of design is potentially binding different stakeholders together, and it clearly also has a performative dimension. The "presenters" of the object of design, of course, have to be elected and enrolled by the other participants, but once engaged, they are active participants in a design Thing as a collective of humans and non-humans.

We might also view these "presenters" as boundary objects in participatory design Things.[18] They stabilize the design Thing and allow some transference and commonality across the boundaries of language-games, but they also acknowledge that different stakeholders might at the same time hold very different views. Hence, in any design process, when establishing heterogeneous design Things with multiple stakeholders, considering how such

15 See Pelle Ehn and Morten Kyng, "Cardboard Computers," in *Design at Work: Cooperative Design of Computer Systems*, Joan Greenbaum and Morten Kyng, eds. (Hillsdale, NJ: Lawrence Erlbaum Associates, 1991),169-96, and Pelle Ehn and Dan Sjögren, "From System Description to Script for Action in Design at Work: Cooperative Design of Computer Systems," in *Design at Work: Cooperative Design of Computer Systems*, 241-68.

16 Ehn, *Work-Oriented Design of Computer Artifacts.*

17 Pelle Ehn and Åke Sandberg, *Företagstyrning och Löntagarmakt (Management Control and Labor Power)* (Falköping: Prisma, 1978).

18 Star, "The Structure of Ill-Structured Solutions," 37-54.

boundary objects can be identified and enrolled would be important, as would being aware of the diverse meanings that these "presenters" might carry in relation to the different stakeholders.

With this view of Participatory Design as participative, entangled design Things that align language-games with heterogeneous matters of concern, and of design objects or devices both as "presenters" for the evolving object of design and as boundary objects for binding these heterogeneous language-games together, we now look to the challenges of this participative approach.

Infrastructuring Things and Design after Design

One limitation of participatory design Things as we've conceptualized them is the focus on projects supporting identifiable users. Basically, the design process described is laid out to support such users' interests, and the products or services designed are to be supportive of these interests as well. Critics have accurately pointed out that there are stakeholders other than immediate users and that people appropriate designs in unforeseen ways. Envisioned use is hardly the same as actual use, no matter how much participation has occurred in the design process.

Do the idea of Participatory Design and the strategies of envisioning "use before use" have to be given up altogether then? What can designers do, and how are these design actions related to unforeseen users' appropriation of the object of design into their lifeworlds? How can users in their everyday activities understood as a kind of design activity, be inspired by and "enact" the traces, obstacles, objects, and potentially public Things left by the professional designers? These design Things are different from those played and performed by designers in a project, but nevertheless, they are design Things (in use). We are not suggesting, of course, that all appropriation in use can or should be understood as design Things. However, we do recommend opening up design approaches in a design project to explicitly support this kind of appropriation in use after the specific design project.

In such an approach, both professional designers and potential users are seen as designers, much as in "traditional," project-bound Participatory Design; but rather than participating in design Things as synchronous entangled language-games, they are participating in design Things separated in time and space. Rather than focusing on involving users in the design process, focus shifts toward seeing every use situation as a potential design situation, as suggested for example by Fischer and Sharff.[19] So there is design during a project, but there is also design in use. There is design (in use) after design (in the design project).

19 Gerhard Fischer and Eric Scharff, "Meta-Design—Design for Designers," in *Proceedings of the 3rd Conference on Designing Interactive Systems* (DIS 2000), D. Boyarski and W. Kellogg, eds. (New York: ACM, 2000), 396-405.

Hence, in design Things carried out in a project, (professional) designers have to acknowledge that design Things potentially will go on in use, and they eventually might also have entirely new stakeholders. Hence, in design Things, the crucial perspective at project time is to open up for new design Things in later use. This shift in focus moves from design Things that aim at useful products and services, to design Things that support good environments for future design Things at use time. Shifting from traditional design for use Things to ongoing design for design Things, we seem confronted not only with design Things that engage multiple stakeholders and presenters, but also a chain of one design Thing after another. So the move is toward design Things (at project time) designing potential boundary-objects (infrastructure) that can be supportive of future design Things (at use time). However, the relations between these design Things, rather than being clear-cut, form a web of interwoven language-games over time.

Star and Ruhleder have called such mediation infrastructuring, identifying it as more of a "when" than a "what."[20] An infrastructure (e.g., railroad tracks, cables, or the Internet) reaches beyond the single event (temporal) and the site event (spatial); it does not need to be reinvented every time; and it is embedded into other socio-material structures. However, the infrastructure also is accessible only by participation in specific practices. Hence, infrastructure, or rather *infrastructuring*, means aligning socio-material public Things; it is relational and becomes infrastructure in the relationships between design Things at project time and (multiple, potentially controversial) design Things in use. This infrastructure is shaped over extended timeframes, not only by professional designers, but also by users as mediators and designers who "infrastructure" in ways never envisioned at project time. Infrastructuring entangles and intertwines activities at project time (e.g., selection, design, development, deployment, and enactment) with everyday professional activities at use time (e.g., mediation, interpretation, and articulation), as well as with further design in use (e.g., adaptation, appropriation, tailoring, re-design, and maintenance).[21]

An infrastructuring strategy, according to architect Stan Allen, must pay attention to how existing infrastructures condition use, but in doing so, it also must deliberately design indeterminacy and incompleteness into the infrastructure, leaving unoccupied slots and space free for unanticipated events and performances yet to be.[22] Such strategies for opening up controversial Things serve as a kind of "event architecture," where the focus is on designing "architecture-events" rather than "architecture-objects," asserted Tschumi.[23] Here, the infrastructure supports multiple and heterogeneous, often controversial, design Things in use (rather than homogenous and unitary ones).

20 See Susan L. Star and Karen Ruhleder, "Steps Toward an Ecology of Infrastructure: De¬sign and Access for Large Information Spaces," *Information System Research* 7, no. 1 (1996): 111-34; see also Susan L. Star and Geoffrey C. Bowker, "How to Infrastructure," in *The Handbook of New Media*, Leah A. Lievrouw and Sonia M. Livingstone, eds. (London: Sage Publications, 2002), 151-62.

21 See Helen Karasti, Karen S. Baker and Florence Millerand, "Infrastructure Time: Long-term Matters in Collaborative Development" *Computer Supported Cooperative Work*, 19 (Berlin: SpringerLink, 2010), 377-405; Michael Twidale and Ingbert Floyd, "Infrastructures from the Bottom-Up and the Top-Down: Can They Meet in the Middle?" in Proceedings of the Tenth Anniversary Conference on Participatory Design (2008) (Bloomington: Indiana University Press, 2008), 238–24; and Volkmar Pipek and Volker Wulf, "Infrastructuring: Toward an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association for Information Systems* 10, no. 5 (2009): 447-73.

22 Stan Allen, Diana Agrest, and Saul Ostrow, *Practice: Architecture, Technology and Representation* (London: Routledge, 2000).

23 Bernard Tschumi, *Event Cities (Praxis)* (Cambridge, MA: MIT Press, 1994).

With an infrastructuring design approach at project time, then, perhaps one should try to develop the very object of design as public Things that potentially, by the appropriation and enactment by its users, can lead to new objects that in turn can make their way into the users' lifeworlds and already existing ecologies of objects. But this vision cannot be approached as design from nowhere. As we have mentioned, Participatory Design once grew out of a concern about how design could support resource-weak groups when information technology was introduced to the workplace. The designer in this case was clearly positioned in the midst of controversies regarding how the design was implemented in use. Continuing Participatory Design into design as infrastructuring, design-for-design, and design-in-use, the same guiding values—once advocated to counter a hierarchical and formalistic design process characterized by dominance—may prove useful. Dominance, hierarchy, and formalisms are certainly ways in which many social, technical, and spatial infrastructures can be characterized. Hence, the rational idea of democracy and legitimate participation might, in design as infrastructuring, lead to a focus on support for the emergence of design Things as "agonistic public spaces." As Mouffe argues, the goal of democratic politics is to empower a multiplicity of voices in the struggle for hegemony and to find "constitutions" that help transform antagonism into agonism, moving from conflict between enemies to constructive controversies among "adversaries"—those who have opposing matters of concern but who also accept other views as "legitimate."[24] These activities are full of passion, imagination, and engagement. As such, they are more like creative design activities than rational decision-making processes. We must then also pay special attention, as Star points out, to those "marginalized by standardized networks" or infrastructures.[25] These "creative design activities" cannot be performed in any universal sense as "design from nowhere," but, as Haraway puts it, only as "politics and epistemologies of location, positioning, and situating," where partiality rather than universality is the condition that allows users to be heard and to be understood in making "rational knowledge claims."[26] This is what Suchman has called the "local accountability" of researchers and designers.[27]

In this perspective, design becomes a question, not so much about the new or about innovative products, but, according to Barry, more about everyday practice in particular sites and locations.[28] This is a practice committed to the work of envisioning emerging landscapes of design through which social and material transformations take place, landscapes shaped by the opening up of questions and possibilities.

As we understand it, these challenges also relate to the design-thinking vision of designers engaging in design thinking and the bigger picture design, for example, to IDEO projects on

24 Chantal Mouffe, *The Democratic Paradox* (London: Verso, 2000).

25 Susan Star, "Power, Technology and the Phenomenology of Conventions: On Being Allergic to Onions," in *A Sociology of Monsters: Essays on Power, Technology and Domination*, John Law, ed. (London: Routledge, 1991).

26 Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 2 (1988): 589.

27 Lucy Suchman, "Located Accountabilities in Technology Production," *Scandinavian Journal of Information Systems* 14, no. 2 (2002): 91-105.

28 Andrew Barry, *Political Machines: Governing a Technological Society* (London: Athlone, 2001).

design for social impact. In a European tradition, these challenges have been addressed as design for social innovation. Social innovations can be products or services just like any innovation, but they can also be a principle, an idea, a piece of legislation, a social movement, or an intervention—or some combination of these innovative possibilities. The key aspect is their capacity to simultaneously meet social needs and create new social relations. The Young Foundation in the United Kingdom has been a major player in developing the social innovation perspective in theory and practice.[29] Italian designer and researcher Ezio Manzini and the international group of people around him have been primary drivers in spreading such design practices.[30] Here, new ideas emerge from a variety of actors directly involved in the problem to be addressed: end users, grass roots designers, technicians and entrepreneurs, local institutions, and civil society organizations. From this perspective, design is no longer just a tool for the development of functional, innovative consumer products but is increasingly seen as a process for radical change—for developing services, systems, and environments that support more sustainable lifestyles and consumption habits. A foundational concept for Manzini and his colleagues is "collaborative services:" The role of the designer is initially to support the development of new concepts and later to make them attainable so they can result in "social" enterprises.[31]

Approaches to social innovation are in line with the ideas of Participatory Design and design as infrastructuring, and with the corresponding guiding values put forth in this paper. Social innovation offers challenging ways for designers to deal with both Participatory Design and infrastructuring design Things.

In the next section, we elaborate on the challenges of infrastructuring design Things, based on our own experiences.

Exploring Infrastructuring Design Things in Practice

Our experiences related to social innovation infrastructuring of design Things have come through the Malmö Living Labs project, which started in 2007 as a small-scale laboratory to explore how subcultures could be enhanced with new media.[32] The project may be characterized as providing venues for open-ended, prototypical practices, or arenas for communication and negotiations.[33] In practice, this environment has required that we build trust and long-term relationships with the various lab partners, and as a result, we have avoided having clearly predefined projects and project constellations. Instead, our aim has been to create working relations that allow for various constellations to develop and for different possibilities to be explored. Our role in such an open-ended design situation has been to conduct continuous match-making processes, where partners co-develop future possibilities and try

29 See Robin Murray, Julie Caulier-Grice, and Geoff Mulgan, *The Open Book of Social Innovation* (London: The Young Foundation, 2010).

30 See François Jégou and Ezio Manzini, *Collaborative Services: Social Innovation and Design for Sustainability* (Milan: Poli Design, 2008).

31 Ibid.

32 Malmö Living Labs is a program within Medea, a co-production and collaborative media initiative at Malmö University, Sweden (www.medea.se). Malmö Living Labs is sponsored by Vinnova, the Swedish Knowledge Foundation, and by the European Union Regional Development Fund.

33 See Björgvinsson, *Socio-Material Mediations*; Hillgren, *Ready-Made-Media-Actions*; Malmö New Media Living Lab, www.malmolivinglab.se (accessed February 23, 2012) and Erling Björgvinsson, "Open-Ended Participatory Design as Prototypical Practice," *CoDesign* 4, no. 2 (June 2008): 85-99.

Figure 1
Early Workshop with RGRA.

them out in real settings. Given that grassroots organizations and cultural producers are typically more resource-weak than the design, media, and IT companies, we pay special attention to foregrounding concerns and issues these partners face and to how they match up with matters the company partners face.

The starting point for our infrastructuring process was the arts and performance center, INKONST, which hosts a variety of non-governmental organizations (NGOs) and stakeholders that run activities and events related to film, performance, theatre, concerts, and music clubs. Although we have set up experiments with several of these stakeholders, for the purposes of this paper, we concentrate on RGRA, a grassroots hip-hop community (aka The Face and Voice of the Street), whose members are first- and second-generation immigrants living in the suburbs of Malmö (see Figure 1). In hindsight, we can see how RGRA has been involved in a number of design Things: Now we see that what started out as broad, open-ended explorations has resulted in various constellations of projects in which RGRA youngsters and design researchers have collaborated with media companies, mobile phone software developers, mobile game developers, public transport companies, Swedish public television and radio, and city of Malmö departments. Several constellations have grown out of everyday issues: exploring how RGRA could engage in street journalism through mobile video broadcasting, dealing with dilemmas such as how professional media and grassroots media can collaborate, and looking at how to mediate a talent competition aimed at letting people in different parts of the city and enjoying and participating in different musical traditions meet and interact. Another strand of matters of concerns has centered on how RGRA might have a more visible and legitimate presence in the urban environment.

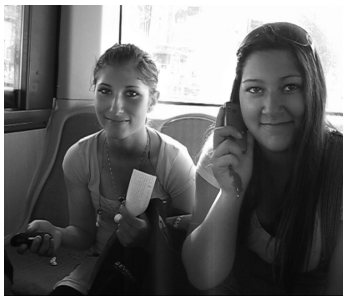

Figure 2
Passenger Listening to a RGRA Song Downloaded to her Mobile Phone on the Bus.

A First Network of Working Relations Emerging into a Thing

During the open-ended infrastructuring process, several Things have emerged from the bottom up as one Thing led to another. Thus far, two of them have grown into more traditional research projects with more clearly defined project goals. The first concerned how RGRA could create new channels to distribute music produced by its members. The Thing's starting point was an early workshop between the Labs' designers and RGRA, where ideas emerged that RGRA could set up Bluetooth poles at strategic places or that Bluetooth senders could be put on buses, transforming the bus company into a media provider. (Many youngsters in Malmö spend up to two hours a day on a bus commuting back and forth to school.)

The interaction design company Do-Fi, which specializes in developing Bluetooth services, saw potential in the idea and agreed to participate in setting up a first round of experiments, as did two of our research colleagues at the university with special competence in place-centric computing. Skånetrafiken, a company in charge of the public transport in the region, and Veolia, which is contracted to operate many of Malmö's bus routes, also agreed to participate and to give access to the buses. The experiments indicated that the buses could become a new space for RGRA to distribute the music of its members and thus become more visible (see Figure 2). The bus company saw new commuter services geared toward teenagers, which could potentially diminish vandalism. Do-Fi saw the potential of developing a new product and new services in collaboration with the company, Epsilon Embedded Systems. The researchers saw the potential of developing a new research project focusing on place-specific media. The group consisting of all of these stakeholders was granted research funding to develop a portable, low-cost media hub.

In one sense, the Bluetooth bus undertaking can be seen as just another experiment—but that view does not tell the whole story. This undertaking was also a Thing. The experiment revealed not only the possibility of aligning different matters of concern, but also controversies and conflicting matters of concerns. One controversy concerned the constellation of partners. RGRA members had split emotions and varying opinions about whether they should collaborate with Veolia because the international branch of the company at that time was engaged in building transportation infrastructure in East Jerusalem, on what is perceived by many Arabs to be Israeli-occupied Palestinian territory. At the same time, they saw that they could gain financially by participating and could benefit from having access to the network of actors. RGRA decided to participate on the condition that RGRA's and Veolia's logos would not appear next to each other in any press material. RGRA, foremost, was collaborating with the researchers and the interaction design company and only indirectly was working

Figure 3
Youngsters Exploring a Neighborhood with the UrbLove Mobile Game.

with Veolia. The bus experiment also generated debates around immaterial property rights: Who could apply for patents, and who should gain financially if a new form for Bluetooth push technology was developed? It also raised questions about what type of (media) space the interior of the bus could be. Could it be transformed into a more public and inclusive space, or is it to remain an exclusive space leased out only to commercial actors, as is the case today?

Expanding the Network of Working Relations into a New Thing

RGRA members' experience of being to a large degree invisible in the urban environment parallels their feeling that their neighborhoods are largely unknown by people living in other parts of the city. (A common view is that their neighborhoods are dangerous.) One approach suggested by the group's members to handle this lack of connection or visibility is to construct "tourist" routes in their suburbs and guide people through the areas. To investigate this issue, a new Thing emerged, this time assembling RGRA, Do-Fi and researchers with the company Ozma Game Design, and the city of Malmö. The strategy was to see how the mobile game platform UrbLove, developed by Ozma, could be used to create new experiences of RGRA neighborhoods. Using the platform, young people can explore urban environments by solving "text"-quizzes related to specific places. Combining Ozma's gaming platform with Do-Fi's Bluetooth technology seemed fruitful because players would be given the capability to download media files at specific spots. An initial experiment in which youngsters from RGRA helped to develop a game path in their neighborhood was conducted. They selected places, made questions, and provided locally produced music files available for Bluetooth download, the lyrics of which related to the game (see Figure 3).

A trial game played by other youngsters showed (1) that they found gaming to be an interesting approach to learning about unknown urban environments, (2) that the game created a spontaneous interaction between the players and the locals, and (3) that developing a game engine with which the youngsters could easily make their own game paths was needed. The most important issue addressed in this Thing concerned which areas of the city are worth exposing in a positive light. The actors in this Thing applied for and received research money to explore how an open game engine could be developed and used to bridge urban barriers. This example illustrates how design Things also develops into specific projects (that then later may become part of new design Things).

In general, our experiences emphasize the challenging yet constructive ways in which unifying participation and infrastructuring can extend beyond the traditional design project and into new kinds of design Things. When reflecting on the shift from our previous experience of "projecting" to "infrastructuring," we see our strategy has changed in several ways to allow for working with infrastructuring for ongoing Thinging, or design-after-design. First, we have worked on creating ongoing working relationships or new forms of infrastructuring practice(s) so that heterogeneous partners can bring forth the issues or possibilities they want to explore and see if their vision or issue makes sense and matches with other partners' concerns. This approach has meant creating loose agreements and work practices on how to approach the unknown. This aspect of our work has been central because we live in a fluid society where access to a rich network of actors and resources is central—particular for providing the connections that those who are resource-weak tend to lack. It also has meant focusing on how specific issues and possibilities can be handled by creating ongoing infrastructuring processes, without predetermined sets of partners, that require reoccurring Things rather than a final solution. Our goal is to ensure that (1) these processes set precedents in ways that allow those participating to set up their own infrastructuring processes and Things, and (2) the objects designed allow for design-after-design and have at least elements of Thinging. In RGRA's case, the aim has been to create conditions that allow ongoing design of Things and infrastructuring to happen. At this time, RGRA members do not construct any objects on their own, although the aim is that they will. However, in both of the cases described, we have seen Things go beyond a specific project into more sustainable and long-term learning and working relationships. The relationship between the company Do-Fi and RGRA has, for example, gradually emerged into a self-sustaining collaboration. During the past two years, they have collaborated on several experiments within the framework of Malmö Living Labs.

Their complementary competencies have been mutually recognized as valuable resources. They now are planning to form a company together.

Such Living Lab experiences bring to light the challenges that proponents of Design Thinking need to address. Although we agree with the basic tenets of Design Thinking, we argue that, to become a sustainable endeavor, it needs to go beyond projecting and be seen as ongoing infrastructuring for Thinging. Our experiences also show that those of us who take up the challenge of design-for-design need to consider how it can be done beyond making products that can be configured at use-time—in other words, how we as designers can develop practices that are always already ready for ongoing changes. This challenge is one we also bring with us as we seek to take our Living Labs infrastructuring design Things experience one step further.

Things That Matter?

During the past years, we have been able to scale up our Living Labs design Things engagement. To maintain our close working relationships and the trust built among our partners, we have decided to grow three small collaborating labs, rather than one large lab. The city of Malmö is characterized by multi-ethnicity, cultural production, youth culture, and new media industry. These aspects also lead to the rationale behind the content orientation and cultural and geographic position for the three collaborating living labs innovation milieus: "The Stage," "The Neighborhood," and "The Factory." Although they differ in orientation and geographic location, these three living labs are all founded on some shared ideas and values. They are all based on user-driven design and innovation activities, growing out of social movements. They also are planned as open innovation social and technical platforms, integrated with the broader innovation systems in the city and region. From this position, they invite collaboration between people, companies, public agencies, cultural organizations, and NGOs, thus opening the borders and aligning potentially conflicting matters of concerns between users driving innovation, business incubators, new business models, research and education. Finally, although not driven by it, these environments all explore the potential of new media for co-creation and social innovation. As such, they support the collaboration between amateurs and professionals in collaborative cross-media productions. They use social media in co-creation projects leading to new services and products, and when applicable, they use new media co-creation strategies, such as open source, open content, do-it-yourself, etc.

Emerging design Things include a multiethnic group of women with a broad range of language skills organizing a collaborative service through which they provide meals for a large group

of arriving refugee orphans, urban planning initiatives by citizens using new tools and participative processes, and the implementation of a creative commons business model that supports independent movie makers in financing and distributing their productions.

This infrastructuring of design Things might seem a long way from designers' participating in projects with typographers and machinists who are struggling to democratize the workplace in the 1970s. However, in our view the basic design approach and values represent a continuation of that movement, and the progression results in ways to seriously engage in controversial design Things—ways that seem to converge with, but also challenge, contemporary design thinking.

In the early development of Participatory Design, proponents envisioned a new role for the designer in setting the stage for collaborative design Things at project time. In this paper, we have further elaborated on the designer's role in supporting future appropriation—as a kind of design at use time, as ongoing infrastructuring design Things.

We opened the paper with reference to Bruno Latour's view on things as socio-material assemblies and collectives of humans and non-humans and his quest for a thing philosophy. As a final note, we bookend this paper with the position of pragmatist philosopher John Dewey on controversial Things and the public - that in fact the public is characterized by heterogeneity and conflict.[34] Designing for, by, and with stakeholders may be challenging enough where common social objectives are already established, institutionalized, or at least seen as reasonably within reach. These social communities are supported by relatively stable infrastructures. The really demanding challenge is to design where no such consensus seems to be within view, where no social community exists. Such political communities are characterized by heterogeneity and difference with no shared object of design. They are in need of platforms or infrastructures, "agonistic" public spaces—not necessarily to solve conflict, but to constructively deal with disagreements. In such heterogeneous design Things public controversial matters can unfold as actors engage in alignments of their conflicting objects of design. Design thinking that wants to make a difference cannot ignore the challenge of passionate engagement in controversial design Things.

34 John Dewey, *The Public and Its Problems* (New York: Henry Holt and Company, 1927); Noortje Marres, "Issues Spark a Public into Being," in *Making Things Public: Atmospheres of Democracy*, Bruno Latour and Peter Weibel, eds. (Cambridge, MA: The MIT Press, 2005), 208-17.