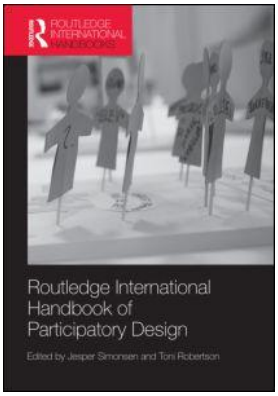


# Routledge International Handbook of Participatory Design

Jesper Simonsen, Toni Robertson

## Design

Publication details
https://www.routledgehandbooks.com/doi/10.4324/9780203108543.ch3
Liam J. Bannon, Pelle Ehn
**Published online on: 06 Aug 2012**

# 3

# Design

## Design Matters in Participatory Design

*Liam J. Bannon and Pelle Ehn*

This chapter focuses on design in Participatory Design, enquiring into why and how design matters to the field. It traces the relations between various design traditions, from the Bauhaus and the modern design movement, through socio-technical and systems design, to the design research movement. It engages with the design frameworks of Herbert Simon and Donald Schön, and discusses challenges to Participatory Design from contemporary 'critical design' practices. It continues by addressing the design challenges facing Participatory Design as it confronts changing social, economic, technical and political landscapes. It examines the emergence of social media and the generation of new social spaces – arenas for public participation and the generation of new forms of peer production. Finally it suggests that a major design challenge for future Participatory Design is to 'draw together' controversial 'things'.

The chapter begins with a prologue that introduces the birth of the design movement, the Bauhaus, with its goal of uniting art and technology. It then proceeds to discuss a series of developments in the design field and outlines their influence on Participatory Design. The next section of the chapter outlines a variety of challenges – social, economic, political and technological – that confront Participatory Design today, and indicates how Participatory Design might address these challenges in a 'designerly' way. Finally, in the epilogue it advocates that Participatory Design should attempt to engage in creating things as matters of concern, and shows what this might mean for a future Participatory Design practice.

The chapter provides a brief historical account of certain Participatory Design-related design traditions, also noting design topics and themes that are emerging as of importance within the Participatory Design field. It provides some pointers to recent research that engages with issues of social innovation, through the use of new social media, and design platforms and infrastructures. While acknowledging earlier work in Participatory Design, the chapter raises questions as to the future of Participatory Design in a changing world, and suggests avenues for further exploration.

Much of the chapter is concerned with outlining a set of challenges which confront the field of Participatory Design, as it reinvents itself to face the changing political, economic, social and technological environment which it now encounters. New technical infrastructures, new socio-economic arrangements, new conditions of work, all impinge on Participatory Design practices, and several such topics are discussed here. How does design matter in all of this, and how can Participatory Design confront these new challenges?

## Prologue: Bauhaus – the birth of modern design and the design object

Design as a profession, concept and movement emerged during hard times – in the socially, economically, and politically unstable aftermath of World War I. A distinctive moment was the inauguration of the *Bauhaus* in 1919, as a new kind of art school different from the fine arts, engaging in a practical way with social change (Droste 1998).

The Bauhaus laid the foundation for what we today think of as *modern design* – 'useful', functionalist, transparent *objects of design*: buildings, furniture and utensils, combining traditional materials like glass and leather with 'modern' materials like steel and reinforced concrete and, later, plastic composite materials and information technology. 'Art and Technology – a new Unity' became after a few years the constructivist motto for turning social utopias into industrially oriented product design and architecture. Buildings and other artefacts should be designed in order to engender social change. By the design of progressive social and cultural values into artefacts, these were then viewed as vehicles for change – through creating the necessary conditions.

Early modern design was also, if not explicitly participatory, at least programmatically collaborative. The Bauhaus was inspired by the notion of the *Bauhütten* – the medieval organisation of craftspeople involved in building cathedrals. Except that the Bauhaus was more about the cathedral of the future – that is, mundane objects that would support people in their everyday, secularised life. It was collaborative and interdisciplinary, as we would say today, joining the different design competences of art, craft, architecture and technology – in order to build a *Gesamtkunstwerk*, a genuinely collaborative design work. The foundation for this work was the collaborative building activities that took place in the Bauhaus *workshops*.

The project was controversial and political, advocating a modernist lifestyle, embodying socially progressive and democratic values, at a time when the influence of Nazism was steadily growing, thus linking its ultimate fate to the 'wrong' side of the political divide in Germany and resulting in its demise in 1933. Now it was the Third Reich that should be realised, and in this design there was no place for the socially radical Bauhaus school, with its rational functionalism as a meeting place for art, culture and technology.

On the international scene the reception of the Bauhaus figures and ideas was quite different. In exile, key figures from the Bauhaus, such as Gropius, Moholy-Nagy and van der Rohe, enjoyed great success in the US. They became the design *avant-garde* for the modern international style (Wolfe 1982). While the Bauhaus was justly celebrated for developing modern design and the international style, it was also criticised by some for its overly harsh forms in steel, glass and reinforced concrete, which were replicated uniformly around the world. The slogan 'architecture or revolution' seemed to imply that a revolution could only be avoided if the modern architects and designers were given the freedom and power to change the world (Berman 1982). The original social engagement in this form of modern design at times became transformed into an undemocratic professional elitism.

Modern design also flourished in Europe after World War II. The Scandinavian countries became internationally known for Nordic design. However, the real breakthrough for functionalism and the impact of the Bauhaus came earlier, with the 1930 Stockholm exhibition and the *acceptera* (accept) manifesto produced by leading functionalist architects and designers (Asplund et al. 1931). Here the espoused vision of the interplay between art, technology and politics was made very clear. The belief in the link between industrial development and social progress was strong. Social problems could be solved with scientific rationality. Salubrious and functional apartments, clothes and everyday objects for the masses were to be produced industrially. Craftwork was to be subsumed under this industrial production. 'Funkis', as functionalism was nicknamed, became synonymous with the growing working class, or at least with

the social democratic parties and their welfare ideology of *folkhemmet*. The legacy was obvious in what became known as Nordic Design, but the forms were somewhat more inviting and warmer – soft curves rather than German exactness, wood rather than metal, and more nuances than the basic colours proclaimed by the Bauhaus. In Denmark it was clearly the cultivated bourgeois middle class who made the style their own. What in Sweden, first and foremost, was perceived as a political conviction, was in Denmark more of a style, literally known as the 'white style'. And in Sweden, despite the initial utopian visions, the reality of Nordic design was perhaps more of an elitist doctrine from above than an approach based on democracy and participation of all concerned.

Where does this leave Participatory Design as a design field? Even if the Bauhaus and modern design concepts in general, with their specific social and aesthetic considerations, were not part of the early Participatory Design movement, we would argue that they were implicit in the background thinking of the Participatory Design pioneers. For instance, the first Participatory Design attempts in Scandinavia in the early 1970s, pioneered in collaboration with the Norwegian Metal Workers Union in the field of computers in the workplace, shared some of the social and democratic values of modern design, especially Nordic Design (for more information, see Chapter 2). Initially the Participatory Design focus was on the shared concerns with the labour movement and its values, rather than on its conception of modern design per se. However, we believe that by the 1980s these modern design ideals had become more explicit in Participatory Design thinking and design practice. A good practical example of this influence is the oft-cited Nordic Participatory Design project UTOPIA, in which computer scientists, social scientists, industrial designers and graphic designers worked together with graphic workers and their unions to design 'tools for skilled work' (Bødker et al. 1987). The extensive use of material mock-ups and prototypes introduced by the industrial designers led to new ways of performing design in Participatory Design such as 'design-by-doing' and 'design-by-playing', actually extending the Bauhaus workshop to also include as designing participants those people who would ultimately be the users of the artefacts designed.

Later, in attempts to 'bring design to software', references to the Bauhaus design concepts once again became more explicit (e.g. Ehn 1988; Winograd 1996) and even institutionalised, as attempts were made to re-establish a latter-day Bauhaus as a 'Digital Bauhaus' (Ehn 1998; Binder et al. 2009). Today the link between these early modern design ideals and Participatory Design is more evident, as design thinking has been introduced into the computer systems and Human–Computer Interaction (HCI) fields, in the shape of the emerging new field of 'interaction design'. This new field provides a more explicit link between the design movement and systems design thinking, by shifting some of the focus on human–machine interaction away from an engineering or human science perspective and towards more engagement with the design community, linking it to other design disciplines such as product design, communication design and architecture.

But now that Participatory Design has become more of an established design field, can we avoid the fate of the Bauhaus and its successor, modern design – i.e. becoming an overly rationalistic and somewhat elitist programme, filling the market with well-crafted functionalist modern design objects for mass consumption? Or is it an even bigger risk that Participatory Design, now incorporating design thinking and offering creative and collaborative environments for user-driven design and innovation, also ends up as the latest fashion in a further modern, market-driven, commodification process (Thrift 2006)? We believe these are major design challenges for the contemporary Participatory Design community, despite all the promising participatory and democratic intentions and statements in our field.

## Introduction

This chapter examines the ways in which the field of Participatory Design engages with the field of design – as both a topic, a research field and a practice. We highlight what we consider are core themes in design, especially as they relate to Participatory Design concerns. The chapter is not intended as a review of the whole design field, nor is it a comprehensive overview of work being done by the Participatory Design community. Rather, our purpose is to mine both traditions for insights into the relation between design topics more generally and ongoing practices in the Participatory Design field.

Our aim, from the title of the chapter, is to address the question of whether, and in what way, design *actually matters* for the Participatory Design community. The intent is to show how Participatory Design work is inextricably bound up in more general design debates, even if the topic of design per se is not always a front-line issue. The structure of the chapter is as follows: we started the chapter with a prologue, focusing on the birth of the design movement, showing how its influence is still with us to this day. Next we provide a short account of certain key intellectual design traditions that have inspired researchers in Participatory Design. We then turn to a series of challenges confronting the Participatory Design field. Finally, in the epilogue we look to the future, exploring the implications for design of Bruno Latour's call for the design field to 'draw things together', and how that might be interpreted within Participatory Design. However, before we proceed with Part 1, we have a few general remarks on the design field and on the nature of Participatory Design.

### *Encountering design*

One of the difficulties in any enquiry concerning the concept of design is that the term (in English) has so many different meanings that it can be difficult to determine exactly what kind of process, practice or product is being examined. The term 'design' comes originally from the Latin *signum* – meaning 'sign', to designate or appoint – via Italian and French, its meaning shifting to mean marking, and then drawing or sketching (marks). Indeed, the word 'design' is both a noun and a verb, and can refer to a process or a product. Design can be viewed as a specialised craft or field of study, or it can be viewed as a general ability inherent in almost all human endeavours. Design can be studied as moments of idiosyncratic individual illumination, where a novel solution to a problem occurs, or it can refer to a scheduled organisational development process. It grew out of the arts and crafts movements at the beginning of the last century offering collaborative *gesamtkunstwerk*, a joining of art and technology. It was also linked to the notion of 'the modern', a focus on rational ways of dealing with creativity and production. This tension between the more humanistic, historical, 'soft' arts and crafts tradition on the one hand, and the rationalistic, scientific, modernist, 'hard' approach on the other, permeates design to this day. Today, design is a major economic force, especially in Western capitalist societies, focusing on both production and consumption. Design thinking is fundamental to business strategies, partly replacing traditional market analysis, and designing and managing have become interwoven in interesting ways (e.g. Boland and Collopy 2004). Design has been credited with creating whole new markets, as witnessed by Apple's redefinition of several commercial arenas – mobile phones, music purchasing and listening, tablet computing, etc. Design companies, especially from Italy and Scandinavia, play a key role in the strategic positioning of products and services. Celebrity designers and design groups have become cultural icons. The role of Participatory Design in these developments is ambiguous. On the one hand, the involvement of 'users' in the design process, as pioneered by Participatory Design research, has become more accepted in mainstream design,

e.g. in activities such as user-centred design practices and 'user-driven' innovation and user-experience design. At the same time, in our designer-led culture, the focus often seems to be on the cult of the designer or design team and their unique insights, which leaves little space for the inclusion of other groups into their design visions, and is inimical to Participatory Design concerns.

We will briefly examine design ideas emerging from these distinct sources – from the humanist, reflective craft tradition, and from the rationalist, modernist design tradition, where ideas of systems thinking have been influential across a variety of design domains, from computing through to product design.

### *Participatory Design*

In exploring the field of Participatory Design, one can briefly start by analysing its constituent terms. The first element, 'participatory', seems to be self-explanatory. It has to do with participation, with how stakeholders – especially users, developers and planners – cooperatively make or adjust systems, technologies and artefacts in ways which fit more appropriately to the needs of those who are going to use them. Participation can be approached as an ideology, and also clearly refers to questions of ethics, politics, democracy and empowerment. This is discussed in several other chapters in this book (see especially Chapters 1, 2 and 4). The meaning of the term 'design' in Participatory Design is less clear, as noted earlier. What is meant by it, and how has it been applied in the field? Is it design as in the crafts tradition, or design as practised in product design, fashion design and architecture? How does design in Participatory Design relate to contemporary design thinking and to design theory? Is design in Participatory Design akin to the 'designerly' design (Cross 1984) we meet in the emerging discipline of interaction design – merging HCI and Computer Supported Cooperative Work (CSCW) with design fields?[1]

We believe that it is important to stress an overarching concern within the 'Participatory Design tradition', if we can call it that, on the 'how' of designing, i.e. a focus on the *practice of design* – the nature of design activities, the need for providing means for people to be able to be involved, the need for respect for different voices, the engagement of modes other than the technical or verbal, the concern with improvisation and ongoing evaluation throughout the design process, etc. It is this concern that may serve as the *leitmotiv* for this chapter. This orientation is distinct from that of others in the design community, where the focus is more on the content, the 'what' of design, rather than the 'how'. In related fields where Participatory Design has had some influence and where design themes can be taken up on occasion, for example in HCI, the emphasis on design practice per se is much less than in Participatory Design proper, and more focused on the resultant product, or service. Even where practice is itself sometimes studied, for instance in ethnographic studies of design, here the focus is usually on the content of the practices and implications for design, which, while of interest, is a perspective distinct from the pragmatic concerns of Participatory Design on the actual 'doing', i.e. design practice.

## Part 1: Understanding design – core themes

While Participatory Design has been practised in a variety of areas, such as urban planning and community development, one of the major areas where its design aspect has been developed has been in the field of technology development and use in organisations. The work of Enid Mumford in the UK was explicitly concerned with issues of how to create more participatory methods for the design of information systems for the workplace (Mumford 1987). So also was

the competing 'Scandinavian' systems development tradition of Kristen Nygaard and his colleagues in Scandinavia, although from a much more explicit and distinctive political stance. Both took inspiration from the action research projects on socio-technical systems conducted by the UK Tavistock group (see below). Participatory Design has been influenced by this action research tradition, in terms of attempting to change situations, not simply study them. In this section, we discuss socio-technical systems, action research, different views on design research, including the science of design and the reflective designer traditions, and briefly note other approaches to studying design that have had varying degrees of influence on the Participatory Design community.

## *Socio-technical systems*

The socio-technical systems approach arose out of studies in UK workplaces after World War II. It became clear that the introduction of systems engineering solutions into organisations did not have the desired effect on productivity. This led to the development of an approach to work reorganisation that focused not only on the social subsystem, or the technical subsystem, but rather on how to jointly optimise the joint system. Failure to pay attention to the design of this social subsystem while simultaneously developing the technical subsystem led to project failures and poor performance. The articulation of this concept of 'socio-technical systems' was developed by researchers at the Tavistock Institute in London while working on studies of coal mining in the UK (Trist and Bamforth 1951).

This approach contradicted the technological imperative in work design, where work organisation was planned by engineers whose priority was fitting people to the requirements of the technology, and not vice versa. It was presumed that offering improved socio-economic conditions via 'human relations' activities could offset any difficulties with this approach. The latter approach, developed in the inter-war years, focusing on improved personnel relations and management–union negotiation, had done little to change the basic structure of jobs and the experience of work. Alienation remained in organisations where the social and the technical aspects of work had been treated as completely separate domains. From this came the conceptual reframing proposed by Trist and colleagues, viewing work organisations as socio-technical systems, and not simply distinct social and technical systems, which should be studied via action research. The term 'system' being used by the Tavistock researchers was developed in the context of the emerging work on 'open systems theory', as promulgated by the biologist/cyberneticist Ludwig von Bertalanffy (1950), whose paper 'The theory of open systems in physics and biology' had just been published. This highlighted the self-regulating and environmental factors involved. The Australian researcher Fred Emery while at the Tavistock substantially developed this 'systems' aspect of the socio-technical approach. The idea was that a work system consisted of both a social system and a technical system interacting with an external environment (both the organisation in which people are working, and the environment within which the firm operates) and that these subsystems needed to be 'in balance' in order for an optimal output from the overall system.

A key feature of this work was the realisation that the notion of system was something that was a perspective framed by the researcher, and not something already defined in the natural world. Also, the later Tavistock work argued for the need for greater industrial democracy (e.g. in the work in Norway of Emery and Thorsrud 1969, 1976) and for forms of worker participation in work changes. While the role of technology in work was studied by the Tavistock, they did not focus on technology design itself, but rather on how technology was introduced and used.

## The 'Scandinavian' approach to systems design

The 'Scandinavian' approach to systems design, though sharing many of the insights of the socio-technical tradition, emerged as a political critique of the socio-technical perspective. This was seen as being overly concerned with a consensual model of participation, while the Scandinavian researchers focused more on the importance of local trade union involvement (Bjerknes et al. 1987). We have already alluded in the prologue to the Norwegian Metal Workers Union project headed by computer scientist Kristen Nygaard (Nygaard and Bergo 1975), one of the inventors of object-oriented programming, analysis and design. Besides being a pioneer in the Participatory Design movement. Nygaard's conception of design was a modelling and systems concept for describing, abstracting and simulating complex, real-life phenomena. Nygaard even developed the DELTA language (in Norwegian 'PARTICIPATE'), a specific high-level object-oriented design language aimed at supporting participatory descriptions of the world. It was assumed that this way of describing and simulating the world would be congenial with the emancipatory interests of the workers and their trade unions. Nygaard's view on design, objects and systems has had considerable influence on many researchers in the Participatory Design field, and continues to this day. The Norwegian experiment led to similar projects with unions being launched in Sweden and Denmark (Ehn and Kyng 1987; Bjerknes and Bratteteig 1987). Supporting workers in understanding the way computers and applications worked was a starting point, but the objective was to attempt to change how these systems worked, to allow for greater human flexibility in the use of systems. The realisation that what was needed was a clear move into the design of technology itself led to the launch of the UTOPIA project, the first Participatory Design project with a clear focus on design issues (Bødker et al. 1987; Ehn 1988).

## Other early systems influences

Other systems design approaches that influenced early Participatory Design were 'soft systems methodology' by Peter Checkland (1981) in the UK, and the book *The Design of Inquiring Systems* by C. West Churchman (1971), the US systems theorist. The 'soft systems' analysis and design approach was developed by Checkland and colleagues at Lancaster University in the UK (Checkland 1981). It was one of the first more collaborative Participatory Design methodologies applied in several Participatory Design projects, encouraging professional designers to examine how they could engage 'users' in the design process (Andersen et al. 1990). The approach acknowledged the existence of a variety of stakeholders involved in any project, and their distinct interests, and how this might impact on the design of any system. Thus, the approach provided ways to support dialogue between competing interests and their (partial) resolution, in order to proceed with design. This approach, as used in Participatory Design, may also be seen as an early attempt to work with more narrative design tools – such as scenarios and storyboards, which later became more widely used within the Participatory Design and systems design community more generally (Chapter 7 gives a rich repertoire of such design tools.).

If 'soft systems' were influential for Participatory Design on the level of participatory tools and methods, the philosophical backbone of the 'systems approach' for many in Participatory Design was shaped by philosopher and pioneering systems thinker C. West Churchman, in his influential book entitled *The Design of Inquiring Systems* (Churchman 1971). While much of the systems engineering approach could be seen as an extension of an overly rationalist and technical approach to real-world problems, Churchman's view openly articulated multiple frames for viewing 'systems', showing how these different perspectives could influence the design of concrete system implementations. Design was seen as the design of knowledge systems.

Churchman shows how our philosophical perspective influences what kind of systems we create, contrasting, for instance, a design focusing on a system and its parts in harmony – which he frames in the context of the philosophy of Leibniz – with a design focusing on a synthesis of conflicting ideas, linking to the dialectical philosophy of Hegel. This way of thinking about design inspired some early Participatory Design thinking concerning the development of a more explicit Marxist design approach, an approach which took its point of departure, not in the synthesis of conflicting ideas, but in dealing with social and material controversies, developing local trade union negotiation design models (Ehn 1988). While the work of Churchman is not as visible in Participatory Design today, he has had a significant impact on the thinking of influential contemporary design researchers (e.g. Nelson and Stolterman 2003).

## *'Design' interventions: inspiration from action research*

Though different in political orientation we note that both the socio-technical tradition and the Scandinavian systems design tradition shared an action-research inspiration for the kind of research and design interventions they developed. Kurt Lewin in the US pioneered the notion of action research during the war years. He wrote that the approach was: 'a comparative research on the conditions and effects of various forms of social action and research leading to social action' (Lewin 1946, p. 35). The key steps in the approach involved 'a spiral of steps, each of which is composed of a circle of planning, action, and fact-finding about the result of the action' (Lewin 1946, p. 38). This approach opened up new possibilities for researchers to engage with interested parties in changing their working/living conditions, and so is sometimes referred to as *participatory action research*. The researcher becomes engaged as one element in a change process, facilitating change, working with the parties concerned, planning change and reflecting on the process of change. This approach was subsequently developed in the UK by researchers at the Tavistock (Trist and Lewin collaborated, and their two research groups were responsible for the launch of the journal *Human Relations* after the war). For many researchers wishing to effect change in society, this research approach opened up new ways of thinking and, importantly, 'doing'. These ideas influenced, directly or indirectly, many subsequent change efforts by groups such as the Tavistock, researchers on socio-technical systems, and Scandinavian interventionist approaches to changing workplaces.

As action research became part of the early Scandinavian Participatory Design projects in the 1970s it also introduced accountability issues that are still central to Participatory Design (Suchman 2002). The early projects had a strong focus on *local accountability*, i.e. the Participatory Design researchers had to recognise that their work must be geared to local needs, and not simply to the production of knowledge for their research peers. For example, the Norwegian metal workers project defined knowledge contributions as knowledge that could support local actions (Nygaard and Bergo 1975; Sandberg 1981). In general there were genuine efforts made to reflect upon, and develop, the role of action-oriented research, knowledge production and democratic ideals (Sandberg 1981). It is also possible to think about this early action research orientation serving as a stimulus to later, more 'designerly' and 'reflective' design research interventions.

## *Design Research and Participatory Design*

We have discussed the origins of the design movement after World War I, in the context of the work of the Bauhaus and others, in the prologue. Another area that influenced early Participatory Design work, and which took inspiration from the Modernist movement, was that of the Design

Research movement. This originated in a series of conferences in the UK in the 1960s that brought together a variety of designers and researchers in an attempt to systematise the understanding of design issues and the nature of design problems. Researchers pursued several lines of investigation, including models of the design process, the exploration of problem spaces, and more psychologically oriented experimental studies of designers as they worked on design problems. Out of this developed a number of books and articles, some attempts at formalising design issues, and also studies on how designers think (Gregory 1966a; Cross 1981, 1982, 1984, 1989; Alexander 1964; Jones 1970; Lawson 1980).

The futurist and inventor Buckminster Fuller, in the context of his thinking about a 'comprehensive anticipatory design science', originally developed the notion of a 'design science'. It was subsequently taken up and reinterpreted by Gregory, in his paper attempting to develop 'the scientific method for design' (Gregory 1966b). He stated:

> Design science is concerned with the study, investigation and accumulation of knowledge about the design process and its constituent operations. It aims to collect, organize and improve those aspects of thought and information which are available concerning design, and to specify and carry out research in those areas of design which are likely to be of value to practical designers and design organizations.
>
> *(Gregory 1996b, p. 323)*

The later work of Herbert Simon (see below) on a 'science of design' seems related to this approach. Later theorists have explored the multiple possible meanings of a design science or, alternatively, a science of design (cf. Cross 2002).[2]

Within a few years the early enthusiasm for formalising the design process and treating design as a field amenable to standard scientific methods faded, as researchers acknowledged that the problems designers were dealing with were so-called 'ill-structured' problems (Rittel and Webber 1973) which were not amenable to precise definition, nor were they suitable for the application of determinable methods to achieve the required result. Thus, while certain of the design methods developed and explored had a certain value, they did not provide an algorithmic solution. The upshot of this realisation was that the notion of a 'design science' that would lead to viewing design activity as involving a well-formulated plan of action and a rule set to be followed was not the way forward. That did not mean that one could not have a scientific approach to the study of design, in terms of using scientific methods to study elements of design, but that is not the same thing as having a design science, as pointed out by Cross (2001). (But see note 2, where we briefly discuss another version of 'design science' that has re-emerged in the information systems field.)

As a result, researchers began to call for a new field of research, and new methods to study the field of design, as distinct from the fields of the sciences and humanities. Archer (1979) has been one of the principal proponents of this third area of human knowledge. As Simon (1969, p. 11) notes, 'The natural sciences are concerned with how things are … design on the other hand is concerned with how things ought to be.' Archer (1981) articulated a notion of the 'designerly mode of enquiry' which he views as distinct from scientific and scholarly approaches. This notion was amplified in the later work of Nigel Cross, where he develops the notion of what he terms 'design intelligence' and 'design ability' (Cross 1982, 1995, 2001). It would be fair to say that this 'modern' design research movement has had a much greater influence on the understanding of design in Participatory Design research than the heritage from the Bauhaus modernist design programme. This is especially the case if we consider the tension between understanding design as rational problem-solving versus reflective practice, our next topic.

## *Design as rational problem-solving versus reflective practice*

The two main approaches discussed in the design field are the *rational problem-solving* model and the *reflective practice* paradigm. The former can be represented by the work of the Nobel Prize winner in economics Herbert Simon, whose book *The Sciences of the Artificial* (1969) had a major impact on the design research community. In this approach, design is conceived as a rational search process, where the designer searches a problem space using formal methods in order to achieve a solution to the problem. With this view design comes very close to, for example, computer science, but it is far removed from the practice-based design approach articulated by the Bauhaus and the modern design movement. Simon's approach has merit and introduces important notions such as that of 'satisficing' rather than simply 'optimising', i.e. achieving a 'good enough' fit between desiderata and product. He also pays attention to the complexity of the task environment and its influence on the design problem, but many designers feel he underestimates the creative aspects of design and the mechanisms by which designers play with possibilities through, for example, sketching, and focusing on possible solutions from the outset. An alternative approach to design thinking, such as that reflected in the work of researcher Donald Schön, seemed more appealing for many Participatory Design researchers (Schön 1983).

Schön's view of the designer as a *reflective practitioner* has become the mainstay of many design frameworks, and has been an important reference point for many in Participatory Design. This view stands in contrast to the rational, problem-solving approach to design. Both Schön and Simon acknowledge the complexity and messiness of design problems or, rather, complex design situations. While Simon suggests ways to transform and reduce this messiness into a stable design space where systems thinking, standard logic and mathematics can be applied, Schön suggests that we pay attention to the ways professionals in their practice master this messiness and complexity 'in the swamp', acknowledging that a stable state is an illusion. The concepts of *reflection-in-action* and *conversations-with-the-material-of-the-situation* – as ways of understanding the professional designers' practice – have become standard references in the Participatory Design community.

This perspective on design as a designerly practice is heavily influenced by the pragmatist philosophy of John Dewey, who posited a general epistemology of creative and investigative processes, where 'experience', seen as growing out of encounters with real-life situations, is taken to be fundamental to understanding (Dewey 1934, 1938). According to Dewey, all creative activities across research and art (not least designerly skills) show a pattern of controlled enquiry: framing situations, searching, experimenting and experiencing, where both the development of hypotheses and the judgement of experienced aesthetic qualities are important aspects within this process. Experiments and learning-by-doing practices are fundamental to Dewey.

Early attempts to apply the pragmatic-reflective and practice approach to a Participatory Design setting was done by Giovanni Francesco Lanzara and Claudio Ciborra, with a focus on design thinking and collaboration (see, e.g., Lanzara 1983) and later by several Participatory Design researchers, with a focus on professional systems designers (Andersen et al. 1990). It has also been used by design theorist Erik Stolterman focusing on the hidden rationality of design work (Stolterman 1991; Nelson and Stolterman 2003; Löwgren and Stolterman 2004). Last, but not least, this pragmatic learning-by-doing perspective has been important for understanding the main Participatory Design design enquiry strategies of prototyping – design-by-doing and design-by-playing (Greenbaum and Kyng 1991).

### *Ethnography and the emergence of design anthropology*

Early Participatory Design work involved learning about working conditions and practices in particular sectors as a prelude to intervention. There was a gradual 'opening up' within the Participatory Design community to the insights from ethnographic studies of work, i.e. field studies of work coming from a sociological or anthropological tradition. These provided fine-grained analyses of work practices and, more importantly, interpreted them within a framework that articulated members' practices. Their focus was on how workers made sense of each other's actions and they showed the artful ways people accomplished their work. The important cross-linkages between ethnography and design are extensively discussed in Chapter 5, so there is no need to elaborate here. However, we do wish to note the emergence of a body of work labelled as design anthropology.

In recent years, the confluence of ethnographers – many from an anthropological background – and designers, has led to the emergence of a new field, labelled design anthropology. While the field is still taking shape, a key characteristic of people working in this area is their attempt to meld the insights gained from an understanding of material culture and members' practices more directly into a more practical, action-oriented Participatory Design agenda. The approach attempts to go beyond performing ethnographic studies that may inform design, or celebrating the unique creative capacities of individual designers and design teams. Rather, they attempt to 'do design' directly, in and through the social settings of everyday life (Halse 2008). To paraphrase Shakespeare, this approach sees the entire world as a stage. As articulated in a recent manifesto set out in a project entitled the Design Anthropological Innovation Model (DAIM) (Halse et al. 2010): '"The Social" is increasingly acknowledged as an important part of the design materials available to the designer for experimentation' (p. 13). It will be interesting to track the evolution of this field and its interconnections with Participatory Design.

### *User-centred design approaches in HCI*

The field of HCI, which emerged in the 1980s, initially focused on developing an applied psychology of the user, viewed as a human information-processing system (Card et al. 1983). Also, the field described the problems people had in using systems, deciphering instructions and recovering from 'errors'. This increased interest in the user and use situations led to a linkage between certain Participatory Design research on use activities and the user-centred design (UCD) field in HCI (Norman and Draper 1986). The UCD tradition helped in focusing attention on the overall system design and on how many supposedly human 'errors' could be traced to systems design flaws, rather than human operator errors per se. The growing understanding of the 'user' not simply as a component but as an active agent in a successful human–machine system provided further impetus to design frameworks that emphasised competent human actors within complex systems (Bannon 1986, 1991). However, despite the word 'design' in 'user-centred design' this HCI community focused overwhelmingly on use rather than design issues, and did not contribute significantly on the 'design' front. However, over the years a certain commingling of work in HCI and in Participatory Design had occurred, both conceptually and empirically (e.g. Bannon and Bødker 1991; Buur and Bødker 2000; Gulliksen et al. 2003).

### *The role of art and critical design studies*

As noted earlier, the influence from the Bauhaus and modern design schools on Participatory Design has been somewhat indirect and rather marginal, compared to systems and socio-technical

design thinking, design as reflective practice, and action research, but there has also been more direct inspiration from art and design schools suggesting that Participatory Design could also be performed as a form of 'critical design'.

While design schools are often seen as existing within the consumer society and its capitalist ethos, there has also been an emergence of a 'critical' design arena exemplified, for instance, by the work done by faculty and students at the Royal College of Art in London under the rubric of 'critical design studies'. Here, 'designs' are intended to provoke reflection and debate among users and viewers. The designers produce alternative provocative events, happenings, mock-ups and shows that hold up a mirror to society and challenge it. While in some cases artists prefer that their work stands for itself in terms of its interpretation, other artists and designers have developed an articulate critique of current fashion, style and discourse within their society, and view their role as not simply 'buying into' the prevailing culture, but wishing to hold up a mirror to it, or in some cases, shattering the images we have of ourselves. The work of designers such as Anthony Dunne and Fiona Raby is a good exemplar of this approach (e.g. Dunne 2005; Dunne and Raby 2001). The relevance of this work to people in Participatory Design is that it provides ideas and inspiration for challenging some of the taken-for-granted positions we adopt in relation to our society.

Other design-related work which questions our assumptions about the world can be found in the work of Bill Gaver and colleagues at Goldsmith's College, London (Gaver 2002). They have moved the debate about HCI and interaction design beyond functionality and efficacy, and have engaged in more searching questions as to the role of design in society and how to design evocative and transformative artefacts. The group engage with ideas of play and ambiguity in terms of the relations between people, activities and artefacts through their articulation of the 'ludic'. While still privileging the design discourse at times to professional designers, some of this work challenges our traditional views and notions of participation, design and use. In a related but more 'academic' mould, recent writings of Sengers and others argue for a new paradigm for design, which they label 'Reflective Design' (Sengers et al. 2005). Interestingly, they explicitly acknowledge the importance of the Participatory Design tradition in the development of their framework.

These approaches may be seen in a broader perspective of art, participation and design. From the time of the Dadaists onwards, artists have questioned our society and its values and have presented alternatives. This artistic background has been present in such movements as the Situationist International in the 1960s, and continues in a modified form in groups such as Reclaim the Streets and Adbusters today. One can, for example, see this in the work of Participatory Design-related artists such as Natalie Jeremijenko, in her work on what she terms 'experimental design', which is grounded in a severe critique of the status quo, with clear design elements. Her work bridges the worlds of art, design, the environment, society and technology itself in interesting and provocative ways. (Her work has been a stimulus for certain Participatory Design projects, and she has presented her work to the Participatory Design community, for example, as a keynote speaker at the biennial Participatory Design Conference in Bloomington in 2008.)

Our focus in Part 1 of this chapter has been to link the field of Participatory Design to a number of people, ideas and communities, in order to show the diversity of influences that have been interwoven in the debates about the role of 'design' in Participatory Design. There is no single path through this space; rather, there are a series of interleavings, each with its own unique features. Just as we have outlined a variety of approaches in the design research tradition, we also need to bear in mind that, while for convenience, we at times refer to 'the Participatory Design community' as a singular entity, we also have a variety of viewpoints and approaches

within this community. In the next section, we investigate a set of design challenges for Participatory Design in the new millennium.

## Part 2: Design challenges for Participatory Design

In the first part of this chapter, we have provided a brief outline of a series of research topics and traditions that we believe have informed the Participatory Design community. This community has in turn made substantive contributions to the design field, especially in terms of design practice. Such books as those by Greenbaum and Kyng (1991), Schuler and Namioka (1993) and Bødker, Kensing and Simonsen (2004) have provided a wealth of material about Participatory Design practices, in terms of how to perform Participatory Design, exemplary projects, etc. The biennial Participatory Design Conferences are also a key resource for those who are seeking the latest work in the field. In recent years, our approach to Participatory Design has had to change in various ways, as a result of a wave of social, economic, political and technological developments. While this is a very large canvas, in the next section we attempt to identify some of the key design challenges emerging from these developments.

### *Changing technology substrates: from systems to infrastructures*

> Infrastructures subtend complex ecologies: their design process should always be tentative, flexible, and open.
>
> *(Star and Bowker 2002, p. 160)*

### Organisational information systems

Much of the early exemplary work in Participatory Design stems from an era where the design of bespoke information systems for organisational units was the norm. However, this situation has changed drastically. Organisations have tended to develop a two-pronged strategy in dealing with the information technology function in their organisations. On the one hand, for larger strategic and operational planning purposes many have bought into large-scale enterprise systems (ERPs). On the other hand, many more local information technology-supported activities are accomplished through the use of simpler applications, and the coupling of a series of off-the-shelf systems, where local adjustments may be made, but the scope for reframing work activities through socio-technical redesign are more limited. The upshot of this change in purchasing is that the traditional kind of bespoke application development, familiar from the 1980s and 90s, is no longer as significant an area of activity. Thus the question becomes: what is the future of Participatory Design in organisational environments where these new forms of information systems are being introduced into the workplace? These kinds of infrastructures (e.g. in electronic patient records, or in customer relationship management) support multiple distinct applications, and allow for a certain amount of end-user modifiability. Indeed, whole new positions are created in developer organisations and in the host organisations to help facilitate the shaping of these generic systems to particular needs. That said, given the previous investment in generic infrastructure, there can be a host of issues as to the extent to which they can be modified to fit particular cases, and the relative (economic) cost of so doing. This challenge for Participatory Design is being addressed in certain research projects, for instance the work of the Danish MUST team (Bødker et al. 2004). Their Participatory Design method supports the work involved in preparing visions for competitive bids and a later implementation project. It addresses outsourcing

situations, and the use of configurable standard solutions in various customer–supplier relations. Design in these contexts takes on a very different meaning than in the more traditional design paradigm and this is an area of growing interest and importance for Participatory Design. No longer are we discussing the development of bespoke information systems together with our local clients, but we have a situation where large-scale commercial infrastructures are being put in place, albeit with some space for building local applications on this infrastructure. We are slowly developing an understanding of the issues involved here, based on accounts of ongoing empirical research in the field, as for example that of Pollock and Williams (2008). Issues of globalisation, generification and personalisation are all involved in complex ways, and the issue is to develop further the methods and techniques of Participatory Design for these kinds of situations. Perhaps there will emerge new niche areas for software application facilitators or 'configuration engineers' who will work with end-user communities in order to tailor these infrastructures for local use. There is evidence that this is already happening (Simonsen and Hertzum 2008). We also see a growing Participatory Design interest in various forms of end-user development approaches that we note below, and we expect to see these issues being addressed more fully in future Participatory Design conferences. Note that these changes affect not only the Participatory Design field, but also other areas of computing and information systems. For example, the Requirements Engineering field has also had to confront this shift from traditional 'requirements' gathering to supporting the development and tailoring of more off-the-shelf systems.

## From tinkering and tailoring to appropriation

There has always been a space, however small, where end-users of technology could make minor changes to their computer-based work environments. However, these local tailorings were often quite limited in scope. Over time, the level of tinkering with systems has been facilitated, to the extent that there is now a whole research domain that focuses on end-user programming and development, with their own conferences, workshops, books and papers (e.g. Eriksson and Dittrich 2009; Costabile et al. 2011). The field of Participatory Design has been active, both conceptually and pragmatically, in developing this whole arena. Also there has been a link between early HCI work on tailoring, and Participatory Design practices, in papers such as Henderson and Kyng (1991). Thus Participatory Design has been concerned about developing opportunities for end-users to shape their environments through modification of systems. Indeed, a more radical understanding of design realises that all systems only become operational through use, so the traditional distinction between design and use becomes somewhat problematic. The work of ethnographers such as Nardi (1993), and other Participatory Design-inspired researchers (e.g. Pipek and Wulf 2009; Spinuzzi 2003) has shown just how inventive users can be in reshaping computing systems to fit their needs.

New open-source software packages provide a plethora of opportunities for people to take, remake, shape and tailor software, and increasingly even hardware, to fit their particular purposes. In so doing, they are also contributing to the growth of the open source movement, and adding to the community know-how and expertise embedded within the corpus of open software libraries and packages available to all. Within such an active, open community space, the need for us to develop more 'designerly' concepts and methods to understand and support these practices is clear. There is a renewed interest in understanding bottom-up innovative practices in general, where people are taking a closer look at such vernacular expressions of 'making do' with resources at hand in areas with resource scarcity. The renewed interest in the topic of appropriation is also of interest. Part of the Participatory Design agenda has been to assist in giving people a voice, in challenging received opinion. In cases of appropriation, we can find

instances where groups take over control and shape technologies to their own ends, and here appropriation can lead directly to empowerment (cf. Eglash et al. 2004; Stevens et al. 2010; Storni 2010).

## Infrastructural variations: Ambient Intelligence or the Internet of Things?

We can observe some differences in the scenarios of future working and living environments currently being portrayed. All scenarios envision a ubiquitous technical infrastructure, a combination of new forms of pervasive computing, such as location-aware systems, networked sensor arrays, intelligent buildings and services, etc. In one scenario, we have a world where not only are our movements tracked, but our intentions are modelled, and even our emotions are supposedly discerned and acted on by 'intelligent' environments. The role of the human actor in the scenarios depicted in these 'ambient intelligence' (AmI) visions seems a rather passive one, as it is apparently the machines who perform most of the sensing, interpretation and even action in the scenarios, not the human. There are many conceptual and pragmatic difficulties with the ambient intelligence vision (e.g. Greenfield 2006; van Kranenburg 2008). It appears that this vision has begun to pall, even for its promoters, and in a recent paper Emile Aarts, one of the originators of the original AmI concept, now argues for a revised approach, AmI 2.0, entitled 'synergetic prosperity' (Aarts and Grotenhuis 2011).

A more open, and still developing, technological vision of the future can be discerned in the evolving debates on 'the Internet of Things' (IoT). The basis for this vision is one where objects in the world become networked together, so that the Internet address space is populated not simply with people and machines but with all kinds of objects that exist in the world. They are not only 'aware' of their state and location, but can also blog about it on the Net. The futurist and media commentator Julian Bleecker (2006) labels such objects 'blogjects' – objects that blog, close relatives of the even more futurist concept of 'Spime', objects that can talk about their interactions, trajectories, etc., as articulated by science fiction writer Bruce Sterling (2005) in his book *Shaping Things*. Exactly what it might mean to have such interconnections, and to what level these objects are not just 'on' the Net, but active agents, are items for debate. What is clear is that the IoT scenario allows for more heterogeneity than that of AmI, and is less closed in its operation. We need to address, as a matter of urgency, how people in the Participatory Design community might engage in the debate about various versions of AmI and IoT in a 'designerly' way. The distinction between things and objects, for example, is just one of the issues that has been addressed in more recent Participatory Design approaches (A.Telier 2011).

## Social media

As information and communication technologies have moved from the desktop to the mobile phone and into people's homes, new electronic spaces have become pervasive, and have become interwoven into our lives. The way we organise our activities has changed; being always online is no longer a feature, but a taken-for-granted aspect of daily living. The changes in technology itself have provided some surprising openings for more participatory practices, albeit with a shifting notion of design. The rise of social media – Web 2.0 applications – has been striking, and has provided a wide range of services that allow people to engage in activities and share their interests and concerns. So, the framing of Participatory Design needs to reflect these changes. What we can clearly see today is a reorientation of software applications – beyond the workplace, and towards everyday life and the public sphere. The provision of such simple mechanisms as Wikis and blogs has allowed for new forms of participation and debate, operating from a local

scale to the global (Jenkins 2006; Gauntlett 2011); Facebook and Twitter allow for new modes of expression, dissemination and comment. While we do not believe the overly naive arguments that these applications themselves have 'caused' revolutions, there is no doubt that they provide an opportunity for people to participate in emergent forums and spread news and opinions rapidly, and in viral-like ways, completely bypassing traditional media channels and thus allowing more open and immediate reporting, though at a cost of lack of editorial curatorship. There is an explosion in user-generated content; traditional separations between media and computing have disappeared. Cross-media platforms are being developed commercially for production and distribution, while audiences are no longer passive but can become active through a variety of alternative platforms, forming alternative communities. In his book on convergence culture Jenkins (2006) argues that the power of these changes lies not in the individual but in the formation of local communities of interest that can exert considerable power, often against traditional media oligarchies. While this has attracted much attention in media studies and among media activists, we can also see new design challenges for Participatory Design. These (media) communities are often as much about *making* as about *communicating*, as demonstrated by Gauntlett (2011). People are increasingly 'making media', producing their own Web 2.0 applications and platforms and mediating other forms of making, as in making food or knitting. Participatory Design practitioners are beginning to explore these developments, searching for new ways in which they can facilitate participation, change and development through these social technologies (Hagen and Robertson 2010). Examples from the recent Participatory Design conferences include: applying a Participatory Design approach to Web 2.0 (Clement et al. 2008), community design (Karasti and Baker 2008), urban planning (Botero and Saad-Sulone 2008; Nuojua et al. 2008) and shaping public spaces (Lindström and Ståhl 2010; Vina 2010).

### *Forms of participatory production*

Just as new infrastructures have altered conditions and challenges for Participatory Design when it comes to information technology, there has been a similar development in the production sphere – from closed socio-technical production systems to more open innovation and participatory production. This is a development not without controversies and Participatory Design design challenges. In this section we will make some remarks on Participatory Design and design challenges from these emerging participatory production approaches and practices. By participatory production we think of such phenomena as open innovation and Living Labs, but also more open peer-production arenas from maker spaces like Fab Labs (Gershenfeld 2005) to social innovation in the public sphere. In many ways we believe that Participatory Design today is in a similar situation to when the field emerged in the early 1970s: participation by users and consumers is seen as fundamental to contemporary production, and now, as then, it is a question of which interests to support – narrow corporate managerial interests or broader more democratic participatory ones?

## Open and user-driven innovation

Innovation activities may be distributed in complex ways through new media, often blurring the borders between citizens, private companies, the public domain and academia. This reorientation is also due to the fact that user-driven design and innovation has become widespread. This development demands that Participatory Design research consider how it relates to ideas and initiatives that concern open and user-driven design and innovation in other research traditions.

Traditional business models of innovation have undergone significant reworking over the past decade. Closed company innovation has given way to 'open' innovation models, where creativity, knowledge and expertise are co-opted wherever they are found (Chesbrough 2003). This more open innovation model raises some major challenges, one such being that a company product-centric view is being replaced by the 'co-creation' of value. While the view of the individual innovator is still common, it is becoming increasingly challenged by the collaborative business environment, seen as a basis for innovation (Prahalad and Krishnan 2008). 'Crowd-sourcing' is one of the new ways for companies to innovate by harnessing 'the wisdom of crowds' through new media (Surowiecki 2004) and 'lead users' (von Hippel 2005), putting them at the centre of attention for user-driven innovation. Much of this discussion is oriented to a narrow market-oriented business model removed from Participatory Design concerns. So, how can Participatory Design research and practice respond to this managerial version of user-driven design and innovation? What is the Participatory Design approach to design, democracy and participation in open innovation? Is there a research perspective on open innovation more in line with the values that once guided Participatory Design?

Defining what innovation is about, who innovates, where and under what conditions innovation occurs, is an important 'contested space' within society today. The recent work of Participatory Design researchers from such groups as SPIRE in Denmark (Buur and Matthews 2008; Buur and Larsen 2010), the Danish Design School (Halse et al. 2010) and Malmö Living Labs (Björgvinsson et al. 2010; Hillgren et al. 2011) are pushing these frontiers with their locally anchored Participatory Design-based innovation strategies, which we believe has great potential for revitalising the discussion about core Participatory Design values in a contemporary setting.

## Living Labs and end-user participation

While we are outlining a series of critical issues for traditional Participatory Design practices in a changing world, we also, paradoxically, note how the Participatory Design field can take credit for the fact that many of the background assumptions of the Participatory Design approach and the methods developed through Participatory Design – e.g. a belief in the right of people to co-determination of their living and working conditions, an awareness of how participation can lead to more appropriable and usable systems, the need for the use of different modalities in workshops, the value of working with mock-ups and prototypes in the design process, etc. – have now become part and parcel of the general field of HCI, interaction design and information systems development. To that extent, some of the battles that have been fought, for example over opening up the design process and making it more participatory, have been 'won', at least in certain Western countries. However, nothing remains constant, and as we have been outlining, the debates and the conditions under which these debates happen have shifted significantly.

A closer look at some of the current topics of concern in information society technologies, at the EU and North American information systems landscape especially, shows an increased awareness of the need to engage in a more participatory way with all stakeholders in the design and development of new technological applications. For example, the Living Labs concept, which has become a major European science and technology policy platform, lays stress on the importance of end-user involvement at all stages of development, of stakeholder engagement, and of the need for early development of prototypes to be trialled extensively in actual working situations. Living Labs emerged as a response to innovation environments that were too closed, which often resulted in failure to innovate, partly because of limited and late interaction with potential markets (Stålbröst 2008). Foregrounding the importance of the users' role and real-life contexts in innovation has thus been central to the Living Labs approach. Common to many of

these approaches is, however, a *product-centric* view. While the rhetoric surrounding the Living Labs concept seems to fit well with a Participatory Design orientation, again some caution is required, as the actual activities of many of the Living Labs do not seem to differ substantively from more traditional innovation models. Indeed, given the visibility of the concept, it is surprising how difficult it is to find more detailed evaluation studies that examine how the Living Labs concept has actually played out in practice, specifically concerning issues of participation, innovation and design.

There are, however, also approaches somewhat akin to that of Living Labs within Participatory Design research, for example 'design labs' (Binder 2007) that foreground active user participation. Such Participatory Design projects can be seen as collaborative learning environments where chains of translations occur across organisational and community boundaries. Another Participatory Design example is the 'Neighbourhood Networks Project', prompting critical engagements between people, technology and their urban environment, using technology in a rhetorical sense to create arguments for better living (DiSalvo et al. 2008). Still another example of critically linking Living Labs and Participatory Design traditions are the Malmö Living Labs, which have been in operation since 2007. With an interventionist action research-oriented approach, the labs constitute a milieu where an open-ended infrastructure for innovation allows a continuous match-making process and prompts quick contextual experiments, exploring whether innovation in practice can be about opening up spaces for questions and possibilities – rather than seeing innovation purely as producing novel products to be marketed. The labs explore in practice whether innovation must be delimited to specific privileged societal groups – experts and lead-users – or whether a more democratic approach is possible (Björgvinsson et al. 2010; Hillgren et al. 2011).

## Fabrication Labs and open production

The Fabrication Labs concept (Fab Labs) can be seen as a combination of a Living Labs experimental environment with participatory ideas of open source and open innovation, though the idea is as old as the Participatory Design tradition. One of the first examples of fabrication spaces can be found in the shared machine workshops from the early 1970s which had enough basic tools, both hand and power driven, to make the building of demonstration models or test facilities a practical and everyday activity (Hess 1979). The concept today has re-emerged, with one focus around work at the MIT Media Lab (Gershenfeld 2005) concerned with packaging a suite of useful machines, tools and applications into a generic low-cost workshop accessible to everyone at very low, or nil, cost. These facilities allow people to fabricate for themselves novel prototypes and actual working models of new products and services. Besides the hands-on imperative, other distinctive features are a culture of sharing and peer-to-peer interactions.

Fab Labs have sprung up around the world, and some of the results of these experiments have indeed been fascinating (Gershenfeld 2005). Again, optimism needs to be tempered with caution, as the practical working through of the Fab Lab concept is not without difficulties, in terms of ownership of tools and of ideas and resulting products and services. In terms of product innovation the impact is still relatively small, the labs' innovation ecosystem is often limited, and they have not yet found a sustainable business model similar to that of open source software (Troxler 2010). There are, however, also promising experiences; the shift from a 'do-it-yourself' to a 'do-it-together' perspective leads to networks from which innovation can arise. 'Community' is one of the main achievements of Fab Labs (Troxler 2010; Seravalli 2011) and it seems that collaborative experiences are most promising when it comes to open source fabrication. For example, Openwear (openwear.org) is an online platform for open source fashion, boosting

the development of micro-fashion initiatives, and Open Source Ecology (opensourceecology.org) is a project based in the US where a group of farmers are building their own machines for farming and construction. They are sharing their drawings and instructions under a project called the Global Village Set, which aims to collect information about how to build a set of machines that should lower the barriers to entry into farming, building and manufacturing. Fabriken is both a site and a community in Sweden which has developed as a merging of Participatory Design, open hardware and Fab Lab culture. This maker space joins Fab Lab machinery and hacker culture (mostly men) with, for example, traditional textile production tools (mostly women) and a bike repair shop (more mixed). Though developed from the perspective of developing new, more user-driven Participatory Design design practices, it also exhibits many controversies and challenges concerning openness, collaboration and democracy in shaping such forms of peer-to-peer production and innovation (Seravalli 2011).

### Public participation and social innovation

Another contemporary design approach that can challenge and inspire Participatory Design is design for *social innovation*. Just as with open and user-driven innovation, this is a broad field with many different agendas ranging from politically conservative attempts to replace the welfare state with market-oriented social entrepreneurs, to grass-roots initiatives responding to local challenges. The key aspect of social innovation is its capacity to simultaneously meet social needs and create new social relations. The Young Foundation in the UK has been a major player in developing the social innovation perspective in theory and practice (Murray et al. 2010) and the British Design Council has, through different transformation design initiatives, pushed a design perspective (Design Council 2004, 2010; see also SILK 2010). Italian designer and researcher Ezio Manzini and the international group around him in Milan and elsewhere have also been spreading design practices where 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 organisations. In 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 – developing services, systems and environments supporting more sustainable lifestyles and consumption habits. A key 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 (Jégou and Manzini 2008). The design critic John Thackara has also been highlighting the design possibilities of such approaches (Thackara 2005; see also Dott Cornwall 2010). There is a strong potential for Participatory Design to contribute to social innovation initiatives, but this also involves a number of challenges: appropriating design practices to fit into working in settings where no object is being designed, where local actors with different agendas and resources interact, and where the Participatory Design researcher is but one of the professional actors claiming the responsibility for promoting social change (Hillgren et al. 2011).

## Epilogue: 'Drawing together' through design things

Design, under the label of design thinking, has become a central issue in modern design discourse and rhetoric, not least in the business sector (Brown 2009; Verganti 2009). Tim Brown, head of the world-renowned design firm IDEO, pushes the design community to think beyond both the omnipotent designer and the obsession with products, objects or things. What he suggests is that designers should be more involved in the big picture of socially innovative design, beyond the

economic bottom line. He argues that design should be viewed as a collaborative effort where the design process is spread among diverse participating stakeholders and competences; ideas have to be envisioned, 'prototyped' and explored hands-on, tried out early on in the design process, in a process characterised by human-centredness, empathy and optimism. What is striking about this business rhetoric is how so many of its elements have been foreshadowed in earlier Participatory Design projects. Some recent business design manifestos similarly articulate a view of design more open to participation and appropriation than is normally the case when designers or design companies take the stage (e.g. Nokia Design Manifesto 2008). We might note how much of the current debate about design in the public arena has come from those closely connected with the industrial practice of design – Philips, Nokia, IDEO, etc. While their various manifestos and arguments are interesting and show an increased openness to social and global economic and environmental concerns such as climate change, social equity, etc., this debate is mainly taking place within the framework of a Western neo-liberal consumer perspective which is certainly open to question. Is this how Participatory Design has become modern? Is the most efficient way to Participatory Design yet another heap of products and services, or is there still a search for participatory, designerly alternatives that go beyond the market agenda?

We have argued that Participatory Design needs to reform in the light of new challenges – technical, socio-economic and political. How to deal with these design challenges must, however, remain open to debate and practical interventions. So, rather than ending this chapter with conclusions, we provide in this epilogue a way to 'open up' thinking about Participatory Design, a way that goes beyond the traditional design project, that acknowledges heterogeneity and conflicts of interest, as well as new forms of participation and engagement. At the same time it addresses questions of democracy and participation that have been at the core of Participatory Design from the very beginning.

The challenge is to 'draw things together', or at least that is how it was formulated by the influential French science and technology scholar Bruno Latour at the Design History Society gathering in Cornwall in a speech in 2008 (Latour 2008). In that talk he observed that designers ever since the time of the Bauhaus and modern design, and even long before that, have demonstrated great skill in designing objects, in 'drawing' architectural sketches, mechanical blueprints, scale models, prototypes, etc. But in this design work he did not find the controversies and the many contradicting stakeholders that these objects bring with them, and he suggested that the designerly 'drawing' skills of designers could be put into play – not just to design single objects, but rather to draw things together, by 'opening-up' controversial things.

The background for this challenge is his position that 'we have never been modern' (Latour 1993). He suggests that the modern separation of nature/object from social/individual is a fake division and that processes of socio-material hybridisation are performed all the time. This would then be the case both before Bauhaus and modern design and after. The implied critique of modern design is towards its obsession with the isolated object, but is this also the case with Participatory Design? The latter has, on the one hand, devised modern and much-appreciated participatory tools and methods for user-driven design and innovation of new products and services. On the other hand, it has also remained traditional, focusing on the role of artefact–human hybrids, be they as collectives of prototypes, designers and users in design projects, or as hybrids of skilled workers and their machines-in-use, where we intervene. Our Participatory Design practices have much of the time been performed in the sphere of hybrids as constructed nature and naturalised social facts. 'Thank God, we never really managed to become modern!' we could exclaim, but beyond that how should we respond to the challenge of drawing things together? Where should Participatory Design then go as a design field, if not as the most

participatory and democratic of modern designs? What is needed are designerly ways of doing Participatory Design that capture, in Latour's words, what has always been the hidden practice of modernist innovation: 'matters of fact have always been matters of concern, objects have always been projects' – and, we might add, projects are preferably approached as 'design things'.

The main approach in Participatory Design has been to organise projects with identifiable stakeholders within an organisation, paying attention to power relations and providing resources with a view to the empowerment of weak and marginalised groups. This has been the main rationale for Participatory Design in contributing to 'democracy at work'. However, design today is rather heterogeneous, partly open and public, engaging users and other stakeholders across organisational and community borders. To capture this change we think it may be useful to shift the frame of reference – from design *projects* to design *things* (A.Telier 2011). The etymology of the English word 'thing' is revealing. Its early usage referred to an 'assembly' around 'matters of concern', taking place at a certain time and in a certain place. Only later did its meaning as 'an entity of matter' or a material 'object' come into use. *Things* in ancient Nordic and Germanic societies were originally assemblies, rituals and places where disputes were dealt with and political decisions made. Latour has called for a contemporary 'thing philosophy' and to make things 'public' (Latour and Weibel 2005). Things are not cut off from human relations, but rather are socio-material 'collectives of humans and non-humans' through which 'matters of concern' or controversies are handled. (At the same time, a designed object/thing – 'an entity of matter' – is potentially a *thing* made public, since once it is delivered to its participants it becomes a matter of concern for them with new possibilities of interaction.)

Hence, it may be constructive to think of Participatory Design assemblies as things, especially if aspects of democratisation are at stake. This helps to explore these design environments as socio-material frames for 'matters of concern' and the alignment of controversies, ready for unexpected use, opening up new ways of thinking and behaving. This perspective may also inform designers as to how they may act in a public space where a heterogeneity of perspectives are in evidence among the actors, in finding alignments of their conflicting matters of concern.

Given this, we might also see a desirable shift in the main Participatory Design design *thing* strategy: from 'use-before-use' (Redström 2008), engaging users and 'prototypes' in a project and collaboratively exploring potential future use, to 'design-after-design', designing for a continuous appropriation and redesign where *infrastructuring* work becomes the main activity. Infrastructure is a central issue, since contemporary design demands extensive collaboration over time and among many stakeholders. But this demands, as Star argues, that we see infrastructure not as a substrate that other actions can run on top of, but rather as an ongoing alignment between contexts (Star and Ruhleder 1996). This is difficult design work, where various contexts or practices and technologies concurrently undergo change, and therefore demand continuous infrastructuring and aligning of partly conflicting interests.

Hence, infrastructuring can be seen as an ongoing process, and should not be seen as being limited solely to the design project phase in the development of a free-standing system. Infrastructuring entangles and intertwines potentially controversial, a priori infrastructure design activities such as development and deployment, along with everyday design activities in actual use – such as mediation, interpretation and articulation, as well as actual design-in-use such as adaptation, appropriation, tailoring, redesign and maintenance (Karasti and Baker 2008; Twidale and Floyd 2008; Pipek and Wulf 2009). As a consequence, what needs to be established are *things* as long-term relationships through artful integration, in which continuous co-creation can be realised, in which those involved pay attention to, and work with, the way technology connects to wider systems of socio-material relation in the form of the collective interweaving of people, objects and processes (Suchman 2002; Björgvinsson et al. 2010).

When reflecting upon the design thinking of Donald Schön and his key impact on Participatory Design, we referred back to the influence of pragmatist philosopher John Dewey. Just as his views on art, science, learning and doing have been very influential in Participatory Design, so his lesser-known views on topics such as controversies and the public may be of interest in the context of our argument here, not least since on these matters Schön seems to deviate from his philosophical heritage. Schön never formally endorsed the concept of Participatory Design per se. He favoured 'conversational design', by which he meant dialogue with stakeholders in a situation, but he was hesitant in his support for the political or democratic side of Participatory Design, in the sense of building a 'constitution' (a republic) to handle controversies (Binder 1996). To Dewey, however (Dewey 1927; Marres 2005) the public is characterised by heterogeneity and conflict. It may be challenging enough to design for, by and with stakeholders, where common social objectives are already established, institutionalised, or at least within reasonable reach. These are social communities supported by relatively stable infrastructures. But the really demanding challenge is to design where no such consensus seems to be within immediate reach, where no social community exists. In short, to design where a political community, a public characterised by heterogeneity and difference with no shared object of design, is in need of a platform or infrastructure, an 'agonistic' public space (Mouffe 2000), not necessarily to solve conflict, but to constructively deal with disagreements – public controversial matters where heterogeneous design *things* can unfold, and actors engage in alignments of their conflicting objects of design. Participatory Design projects that wish to take on the design challenge of 'drawing together' can improve further by adopting designerly skills from the Bauhaus, but they cannot ignore passionate engagement in controversial design *things*.

## Acknowledgements

The authors would like to thank the large number of reviewers who offered critiques and advice concerning several versions of this paper. They include book co-authors: Thomas Binder, Jeanette Blomberg, Carl DiSalvo, Helena Karasti, Toni Robertson, Jesper Simonsen and Ina Wagner. We would like to thank Erling Björgvinsson, Anders Emilsson, Parag Deshpande, Per-Anders Hillgren, Anna Seravalli and Cristiano Storni for many debates and discussions, as well as textual comments. We have attempted to take on board many of their criticisms and suggestions, but are keenly aware that we have not been able to respond to all of their concerns.

## Notes

1 One of the most influential of all design researchers, Nigel Cross, argues that there is a distinct set of 'designerly' capabilities that designers learn and use, different from other scientific and scholarly activities. These capabilities characterise their approach to problems – i.e. being solution-focused rather than problem-focused – and relate to their knowledge of materials, etc. (Cross 1982, 2001).

2 The notion of a 'design science' has resurfaced in the field of information systems as a result of work by Hevner and others (Hevner et al. 2004). An emerging IS community has developed around this concept, resulting in a new conference series, labelled DESRIST. We do not have space to critically discuss this work in the context of the chapter but our initial opinion on this approach is that their 'design science' concept is used in ways which appear rather removed from the design concerns of Cross and others. Thus it appears of limited relevance to the Participatory Design community, at least at this stage, given the limited role provided for human actors in the design process. (See Hovorka and Germonprez 2011 for a short critique.)

## References

A.Telier (T. Binder, G. de Michelis, P. Ehn, G. Jacucci, P. Linde, I. Wagner) (2011) *Design Things*, Cambridge, MA: MIT Press.

Aarts, E. and F. Grotenhuis (2011) 'Ambient intelligence 2.0: towards synergetic prosperity', *Journal of Ambient Intelligence and Smart Environments*, 3: 3–11.

Alexander, Christopher (1964) *Notes on the Synthesis of Form*, New York: McGraw-Hill.

Andersen, N. E., F. Kensing, J. Lundin, L. Mathiassen, A. Munk-Madsen, M. Rasbech and P. Sørgaard (1990) *Professional Systems Development: Experience, Ideas and Action*, Englewood Cliffs, NJ: Prentice-Hall.

Archer, B. (1979) 'The three Rs', *Design Studies*, 1(1): 18–20.

Archer, B. (1981) 'A view of the nature of design research', in R. Jacques and J. A. Powell (eds) *Design: Science: Method. The Design Research Society Conference, Portsmouth, 1980*, Guildford: Westbury House, 30–47.

Asplund, G., W. Gahn, G. Paulsson, E. Sundahl and U. Åhren (1931) *Acceptera*, Stockholm: Tiden.

Bannon, L. J. (1986) 'Issues in design – some notes', in D. Norman and S. W. Draper (eds) *User Centered Design*, London: Lawrence Erlbaum Associates.

Bannon, L. J. (1991) 'From human factors to human actors: the role of psychology and human–computer interaction studies in systems design', in J. Greenbaum and M. Kyng (eds) *Design at Work: Cooperative Design of Computer Systems*, Hillsdale, NJ: Lawrence Erlbaum Associates, 25–44.

Bannon, L. J. and S. Bødker (1991) 'Beyond the interface: encountering artifacts in use', in J. M. Carroll (ed.) *Designing Interaction: Psychology at the Human–Computer Interface,* New York: Cambridge University Press, 227–53.

Berman, M. (1982) *All that is Solid Melts into Air: The Experience of Modernity*, New York: Simon and Schuster.

Binder, T. (1996) 'Learning and knowing with artifacts: an interview with Donald A. Schön', *AI and Society*, 10: 51–7.

Binder, T. (2007) 'Why design: labs?', in *Design Inquiries,* Stockholm: Nordes Conference.

Binder, T., J. Löwgren and L. Malmborg (eds) (2009) *(Re)searching the Digital Bauhaus*, London: Springer Verlag.

Bjerknes, G. and T. Bratteteig (1987) 'Florence in Wonderland – systems development with nurses', in G. Bjerknes, P. Ehn and M. Kyng (eds) *Computers and Democracy: A Scandinavian Challenge*, Brookville, VT: Avebury.

Bjerknes, G., P. Ehn and M. Kyng (eds) (1987) *Computers and Democracy: A Scandinavian Challenge*, Brookville, VT: Avebury.

Björgvinsson, E., P. Ehn and P.-A. Hillgren (2010) 'Participatory Design and democratizing innovation', in K. Bødker, T. Bratteteig, D. Loi and T. Robertson (eds) *Proceedings of the 11th Biennial Participatory Design Conference (PDC '10), November 29 – December 3, 2010, Sydney, Australia*, New York: ACM, 41–50.

Bleecker, Julian (2006) 'A manifesto for networked objects – cohabitating with pigeons, arphids and aibos', in *The Internet of Things*, February. Published on his research blog at http://research.techkwondo.com/blog/julian/185.

Blomberg, J., J. Giacomi, A. Mosher and P. Swenton-Wall (1993) 'Ethnographic field methods and their relation to design', in D. Schuler and A. Namioka (eds) *Participatory Design: Perspectives on Systems Design*, Hillsdale, NJ: Lawrence Erlbaum Associates, 123–55.

Blomberg, J., L. Suchman and R. Trigg (1997) 'Back to work: renewing old agendas for cooperative design', in M. Kyng and L. Mathiassen (eds) *Computers and Design in Context*, Cambridge, MA: MIT Press, 267–87.

Bødker, K., F. Kensing and J. Simonsen (2004) *Participatory IT Design: Designing for Business and Workplace Realities*, Cambridge, MA: MIT Press.

Bødker, S., P. Ehn, J. Kammersgaard, M. Kyng and Y. Sundblad (1987) 'A Utopian experience', in G. Bjerknes, P. Ehn and M. Kyng (eds) *Computers and Democracy: A Scandinavian Challenge*, Aldershot: Avebury, 251–78.

Boland, R. J. and F. Collopy (2004) *Managing as Designing*, Palo Alto, CA: Stanford University Press.

Botero, A. and J. Saad-Sulone (2008) 'Co-designing for new city–citizen interaction possibilities', in J. Simonsen, T. Robertson and D. Hakken (eds) *Proceedings of the 10th Biennial Anniversary Conference on Participatory Design, PDC 2008, Bloomington, Indiana, October 1–5, 2008: Experiences and Challenges,* New York: ACM.

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

Buur, J. and S. Bødker (2000) 'From usability lab to "design collaboratorium": reframing usability practice', in D. Boyarski and W. A. Kellogg (eds) *Proceedings of the 3rd Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, New York: ACM, 297–307.

Buur, J. and Larsen, H. (2010) 'Crossing intentions in participatory innovation', in K. Bødker, T. Bratteteig, D. Loi and T. Robertson (eds) *Proceedings of the 11th Biennial Participatory Design Conference, PDC*

*2010, Sydney, Australia, November 29 – December 3, 2010: Participation: The Challenge*, New York: ACM, 251–5.
Buur, J. and B. Matthews (2008) 'Participatory innovation', *International Journal of Innovation Management*, 12 (3): 255–73.
Card, S., T. Moran and A. Newell (1983) *The Psychology of Human–Computer Interaction*, Hillsdale, NJ: Lawrence Erlbaum Associates.
Checkland, P. (1981) *Systems Thinking, Systems Practice*, Chichester: John Wiley.
Chesbrough, H. (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard, MA: Harvard Business School Press.
Churchman, C. W. (1971) *The Design of Inquiring Systems: Basic Concepts of Systems and Organization*, New York: Basic Books.
Clement, A., T. Costantino, D. Kurtz and M. Tissenbaum (2008) 'Participatory Design and Web 2.0: the case of PIPWatch, the collaborative privacy toolbar', in J. Simonsen, T. Robertson and D. Hakken (eds) *Proceedings of the 10th Biennial Anniversary Conference on Participatory Design, PDC 2008, Bloomington, Indiana, USA, October 1–5, 2008: Experiences and Challenges,* New York: ACM.
Costabile, M. F., Y. Dittrich, G. Fischer and A. Piccinno (eds) (2011) *End-user Development 2011, Proceedings of the 3rd International Symposium, IS-EUD, Torre Canne, Italy, June 7–10*, New York: Springer; LNCS 6654.
Cross, N. (1982) 'Designerly ways of knowing', *Design Studies*, 3(4): 221–7.
Cross, N. (ed.) (1984) *Developments in Design Methodology*, Chichester: John Wiley.
Cross, N. (1989, 1994) *Engineering Design Methods*, Chichester: John Wiley.
Cross, N. (1990) 'The nature and nurture of the design ability', *Design Studies*, 11(3): 127–40.
Cross, N. (1995) 'Discovering design ability', in R. Buchanan and V. Margolin (eds) *Discovering Design: Explorations in Design Studies*, Chicago, IL: Chicago University Press.
Cross, N. (2001) 'Designerly ways of knowing: design discipline versus design science', *Design Issues*, 17(3): 49–55.
Cross, N. (2002) 'Design as a discipline', presentation at the Inter-disciplinary Design Quandary Conference, 13 February, De Montfort University, UK. Text available at: http://nelly.dmu.ac.uk/4dd/DDR3-Cross.html.
Cross, N., J. Naughton and D. Walker (1981) 'Design method and scientific method', *Design Studies*, 2(4): 195–201.
Design Council (2004) *RED* (online). 'RED is a "do tank" that develops new thinking and practice on social and economic problems through design-led innovation'. Available at: www.designcouncil.info/mt/RED/about/ (accessed 24 November 2011).
Design Council (2010) *Public Services by Design* (online). Available at: www.designcouncil.org.uk/our-work/Support/Public-Services-by-Design/ (accessed 24 November 2011).
Dewey, J. (1927) *The Public and Its Problems*, New York: Henry Holt.
Dewey, J. ([1934] 1980) *Art as Experience*, New York: Berkeley Publishing Group.
Dewey, J. ([1938] 1969) *Logic: The Theory of Inquiry*, New York: Henry Holt
DiSalvo, C., I. Nourbakhsh, D. Holstius, A. Akin and M. Louw (2008) 'The Neighborhood Networks Project: a case study of critical engagement and creative expression through Participatory Design', in J. Simonsen, T. Robertson and D. Hakken (eds) *Proceedings of the 10th Biennial Anniversary Conference on Participatory Design, PDC 2008, Bloomington, Indiana, USA, October 1–5, 2008: Experiences and Challenges,* New York: ACM.
Dott Cornwall (2010) *What's Dott?* (online). Available at: www.dottcornwall.com/about-dott/whats-dott (accessed 24 November 2011).
Droste, M. (1998) *Bauhaus 1919–1933*, Köln: Benedikt Taschen Verlag.
Dunne, A. (2005) *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*, Cambridge, MA: MIT Press.
Dunne, A. and F. Raby (2001) *Design Noir – The Secret Life of Electronic Objects*, London: August/Birkhäuser.
Eglash, R., J. L. Croissant, G. Di Chiro, and R. Fouché (eds) (2004) *Appropriating Technology: Vernacular Science and Social Power*, Minneapolis: University of Minnesota Press.
Ehn, P. (1988) *Work-Oriented Design of Computer Artifacts*, Hillsdale, NJ: Lawrence Erlbaum Associates.
Ehn, P. (1998) 'Manifesto for a digital Bauhaus', *Digital Creativity* 9(4): 2007–216.
Ehn, P. and M. Kyng (1987) 'The collective resource approach to systems design', in G. Bjerknes, P. Ehn and M. Kyng (eds) *Computers and Democracy: A Scandinavian Challenge*, Brookville, VT: Avebury.
Emery, F. E. and E. Thorsrud (1969) *Form and Content in Industrial Democracy*, London: Tavistock.
Emery, F. E. and E. Thorsrud. (1976) *Democracy at Work*, Leiden: Martinus Nijhoff.

Eriksson, J. and Y. Dittrich (2009) 'Achieving sustainable tailorable software systems by collaboration between end-users and developers', in S. Clarke (ed.) *Evolutionary Concepts in End User Productivity and Performance: Application for Organizational Progress*, Hershey, PA: IGI Global.

Gauntlett, D. (2011) *Making is Connecting: The Social Meaning of Creativity, from DIY and Knitting to YouTube and Web 2.0*, Cambridge: Polity Press.

Gaver, B. (2002) 'Designing for Homo ludens', *EU I3 Magazine*, 12 (June).

Gershenfeld, N. A. (2005) *Fab: The Coming Revolution on your Desktop – From Personal Computers to Personal Fabrication*, New York: Basic Books.

Greenbaum, J. and M. Kyng (eds) (1991) *Design at Work: Cooperative Design of Computer Work*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Greenfield, A. (2006) *Everyware: The Dawning Age of Ubiquitous Computing*, Berkeley, CA: New Riders.

Gregory, S. A. (1966a) *The Design Method*, London: Butterworth.

Gregory, S. A. (1966b) 'Design science', in S. A. Gregory (ed.) *The Design Method*, London: Butterworth, 323–30.

Gulliksen, J., B. Goransson, I. Boivie, S. Blomkvist, J. Persson and Å. Cajander (2003) 'Key principles for user-centred systems design', *Behaviour and Information Technology*, 22(6): 397–409.

Hagen, P. and T. Robertson (2010) 'Social technologies: challenges and opportunities for participation', in K. Bødker, T. Bratteteig, D. Loi and T. Robertson (eds) *Proceedings of the 11th Biennial Participatory Design Conference, PDC 2010, Sydney, Australia, November 29 – December 3, 2010: Participation: The Challenge*, New York: ACM.

Halse, J. (2008) 'Design anthropology: borderland experiments with participation, performance and situated intervention', PhD thesis, Copenhagen, IT University.

Halse, J., E. Brandt, B. Clark and T. Binder (2010) *Rehearsing the Future*, Copenhagen: Danish Design School Press.

Henderson, A. and M. Kyng (1991) 'There's no place like home: continuing design in use', in J. Greenbaum and M. Kyng (eds) *Design at Work: Cooperative Design of Computer Systems,* Hillsdale, NJ: Lawrence Erlbaum Associates, 219–40.

Hess, K. (1979) *Community Technology*, New York: Harper and Row.

Hevner, A. R., S. T. March, J. Park and S. Ram (2004) 'Design science in information systems research', *MIS Quarterly*, 28(1): 75–105.

Hillgren, P.-A., A. Seravalli and A. Emilsson (2011) 'Prototyping and infrastructuring in design for social innovation', *Co-Design* 7(3–4): 169–83.

Hovorka, D. and M. Germonprez (2011) 'Reflecting, tinkering, and tailoring: implications for theories of information system design', in S. Pekkola and H. Isomaki (eds) *Reframing Humans in Information Systems Development,* London: Springer, 135–49.

Jégou, F. and E. Manzini (2008) *Collaborative Services: Social Innovation and Design for Sustainability*, Milan: Poli Design.

Jenkins, Henry (2006) *Convergence Culture: Where Old and New Media Collide*, New York: New York University Press.

Jones, J. Christopher (1970) *Design Methods: Seeds of Human Futures*, London: John Wiley.

Karasti, H. and K. Baker (2008) 'Community design: growing one's own information infrastructure', in J. Simonsen, T. Robertson and D. Hakken (eds) *Proceedings of the 10th Biennial Anniversary Conference on Participatory Design, PDC 2008, Bloomington, Indiana, October 1–5, 2008: Experiences and Challenges,* New York: ACM.

Lanzara, G. F. (1983) 'The design process: frames, metaphors and games', in U. Briefs, C. Ciborra and L. Sneider (eds) *Systems Design for, with and by the Users*, Amsterdam: North-Holland.

Latour, B. (1993) *We Have Never Been Modern*, Cambridge, MA: Harvard University Press.

Latour, B. (2008*) 'A Cautious Promethea?* A few steps toward a philosophy of design (with special attention to Peter Sloterdijk)', keynote lecture for the Networks of Design meeting of the Design History Society, Falmouth, Cornwall, 3 September.

Latour, B. and P. Weibel (eds) (2005) *Making Things Public*: *Atmospheres of Democracy*, Cambridge, MA: MIT Press.

Lawson, Bryan (1980, fourth edition 2006) *How Designers Think: The Design Process Demystified*, Amsterdam: Elsevier.

Lewin, K. (1946) 'Action research and minority problems', *Journal of Social Issues*, 2(4): 34–46.

Lindström, K. and Å. Ståhl (2010) 'Threads – a mobile sewing circle: making private matter public in temporary assemblies', in K. Bødker, T. Bratteteig, D. Loi and T. Robertson (eds) *Proceedings of the 11th*

*Biennial Participatory Design Conference, PDC 2010, Sydney, Australia, November 29 – December 3, 2010: Participation: The Challenge*, New York: ACM.

Löwgren, J. and E. Stolterman (2004) *Thoughtful Interaction: A Design Perspective on Information Technology*, Cambridge, MA: MIT Press.

Marres, N. (2005) 'Issues spark a public into being', in B. Latour and P. Weibel (eds) *Making Things Public: Atmospheres of Democracy*, Cambridge, MA: MIT Press.

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

Mumford, E. (1987) 'Sociotechnical systems design – evolving theory and practice', in G. Bjerknes, P. Ehn and M. Kyng (eds) *Computers and Democracy: A Scandinavian Challenge*. Brookville, VT: Avebury.

Murray, R., J. Caulier-Grice and G. Mulgan (2010) *The Open Book of Social Innovation*, London: Young Foundation, NESTA.

Nardi, B. A. (1993) *A Small Matter of Programming: Perspectives on End User Computing*, Cambridge, MA: MIT Press.

Nelson, H. and E. Stolterman (2003) *The Design Way*, Englewood Cliffs, NJ: Educational Technology Publications.

Nokia Design Manifesto (2008). Available to download at hiltonbarbour.com/assets/Manifesto-A5-Final.pdf.

Norman, D. A. and S. W. Draper (eds) (1986) *User Centred Systems Design*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Nuojua, J., A. Juustila, T. Räisänen, K. Kuutti and L. Soudunsaari (2008) 'Exploring Web-based participation methods for urban planning', in J. Simonsen, T. Robertson and D. Hakken (eds) *Proceedings of the 10th Biennial Anniversary Conference on Participatory Design, PDC 2008, Bloomington, Indiana, October 1–5, 2008: Experiences and Challenges,* New York: ACM.

Nygaard, K. and O. T. Bergo (1975) 'The trade unions – new users of research', *Personal Review*, 4(2): 5–10.

Pekkola, S. and H. Isomaki (eds) (2011) *Reframing Humans in Information Systems Development*, London: Springer.

Pipek, V. and V. Wulf (2009) 'Infrastructuring: toward an integrated perspective on the design and use of Information Technology', *Journal of the Association of Information Systems,* Special Issue, 10(5): 447–73.

Pollock, N. and R. Williams (2008) *Software and Organisations: The Biography of the Enterprise-Wide System or How SAP Conquered the World*, Abingdon: Routledge.

Prahalad, C. K. and M. S. Krishnan (2008) *The New Age of Innovation: Driving Co-created Value through Global Networks*, New York: McGraw Hill.

Redström, J. (2008) 'Re:definitions of use', *Design Studies*, 29(4): 410–23.

Rittel, H. and M. Webber (1973) 'Dilemmas in a general theory of planning', *Policy Sciences*, 4: 155–69.

Sandberg, Å. (ed.) (1981) *Forskning för förändring* (Research for Change), Stockholm: Arbetlivscentrum.

Schön, Donald A. (1983) *The Reflective Practitioner: How Professionals Think in Action*, London: Temple Smith.

Schuler, D. and A. Namioka (1993) *Participatory Design: Principles and Practices*, Mawah, NJ: Lawrence Erlbaum Associates.

Sengers, P., K. Boehner, J. David and J. J. Kaye (2005) 'Reflective design', *Procedures of the 4th Decennial Conference on Critical Computing*, New York: ACM, 49–58.

Seravalli, A. (2011) 'Democratizing production: challenges in co-designing enabling platforms for social innovation', paper presented at 'The Tao of Sustainability', an international conference on sustainable design strategies in a globalisation contest, Beijing, 27–29 October.

SILK (2010) *Social Innovation Lab for Kent* (online). Available at: http://socialinnovation.typepad.com/silk/ (accessed 24 November 2011).

Simon, Herbert (1969, 1996) *The Sciences of the Artificial*, third edition. Cambridge, MA: MIT Press.

Simonsen, J. and M. Hertzum (2008) 'Participatory Design and the challenges of large-scale systems: extending the iterative PD approach', in J. Simonsen, T. Robinson and D. Hakken (eds) *Proceedings of the 10th Anniversary Conference on Participatory Design: Experiences and Challenges*, *September 30 – October 4, 2008, Bloomington, Indiana*, New York: ACM, 1–10.

Spinuzzi, C. (2003) *Tracing Genres through Organizations: A Sociocultural Approach to Information Design*, Cambridge, MA: MIT Press.

Stålbröst, A. (2008) 'Forming future IT: the living lab way of user involvement', doctoral thesis, Luleå University of Technology.

Star, S. L. and G. Bowker (2002) 'How to infrastructure,' in L. A. Lievrouw and S. Livingstone (eds) *Handbook of New Media – Social Shaping and Consequences of ICTs*, London: Sage, 151–62.

Star, S. L. and K. Ruhleder (1996) 'Steps toward an ecology of infrastructure: design and access for large information spaces', *Information Systems Research*, 7(1): 111–34.

Sterling, Bruce (2005) *Shaping Things*, Cambridge, MA: MIT Press.
Stevens, G., Pipek, V. and Wulf, V. (2010) 'Appropriation infrastructure: mediating appropriation and production work', *Journal of Organizational and End User Computing*, 22(2): 58–81.
Stolterman, E. (1991) 'Designarbetets dolda rationalitet' [The hidden rationality of design work], PhD thesis, Umeå University.
Storni, Cristiano (2010) 'Multiple forms of appropriation in self-monitoring technology: reflections on the role of evaluation in future self-care', *International Journal of Human–Computer Interaction*, 26(5): 537–61.
Suchman, L. (2002) 'Located accountabilities in technology production', *Scandinavian Journal of Information Systems*, 14(2): 91–105.
Surowiecki, J. (2004) *The Wisdom of Crowds*, New York: Anchor Books.
Thackara, John (2005) *In the Bubble: Designing in a Complex World*, Cambridge, MA: MIT Press,
Thrift, N. (2006) 'Re-inventing invention: new tendencies in capitalist commodification', *Economy and Society*, 35(2): 279–306.
Trist, Eric L. (1981) 'The sociotechnical perspective: the evolution of sociotechnical systems as a conceptual framework and as an action research program', in Andrew H. van de Ven and William F. Joyce (eds) *Perspectives on Organization Design and Behavior*, New York: John Wiley. (Also published in substantially the same form and cited as Trist, Eric L. (1981) 'The evolution of socio-technical systems: a conceptual framework and an action research program', *Issues in the Quality of Working Life: Occasional Papers*, no. 2, June, Toronto: Ontario Ministry of Labour.)
Trist, Eric and K. Bamforth (1951). 'Some social and psychological consequences of the longwall method of coal getting', *Human Relations*, 4: 3–38.
Troxler, Peter (2010) 'Commons-based peer-production of physical goods: is there room for a hybrid innovation ecology?' paper presented at the 3rd Free Culture Research Conference, Berlin, 8–9 October 2010. Available at: http://ssrn.com/abstract=1692617.
Twidale, M. and I. Floyd (2008) 'Infrastructures from the bottom-up and the top-down: can they meet in the middle?' in J. Simonsen, T. Robertson and D. Hakken (eds) *Proceedings of the 10th Biennial Anniversary Conference on Participatory Design, PDC 2008, Bloomington, Indiana, October 1–5, 2008: Experiences and Challenges,* New York: ACM.
van Kranenburg, R. (2008) 'The Internet of Things: a critique of ambient technology and the all-seeing network of RFID', *Network Notebooks 02*, Amsterdam: Institute of Network Cultures.
Verganti, R. (2009) *Design-Driven Innovation*, Boston, MA: Harvard Business Press.
Vina, Sandra (2010) 'Engaging people in the public space – ANIMATO, a design intervention', in K. Bødker, T. Bratteteig, D. Loi and T. Robertson (eds) *Proceedings of the 11th Biennial Participatory Design Conference, PDC 2010, Sydney, Australia, November 29 – December 3, 2010: Participation: The Challenge*, New York: ACM.
von Bertalanffy, L. (1950) 'The theory of open systems in physics and biology', *Science*, 3: 22–9.
von Hippel, E.(2005) *Democratizing Innovation*, Cambridge, MA: MIT Press.
Winograd, T. (1996) *Bringing Design to Software*, Reading, MA: Addison-Wesley.
Wolfe, T. (1982) *From Bauhaus to Our House*, London: Jonathan Cape.